



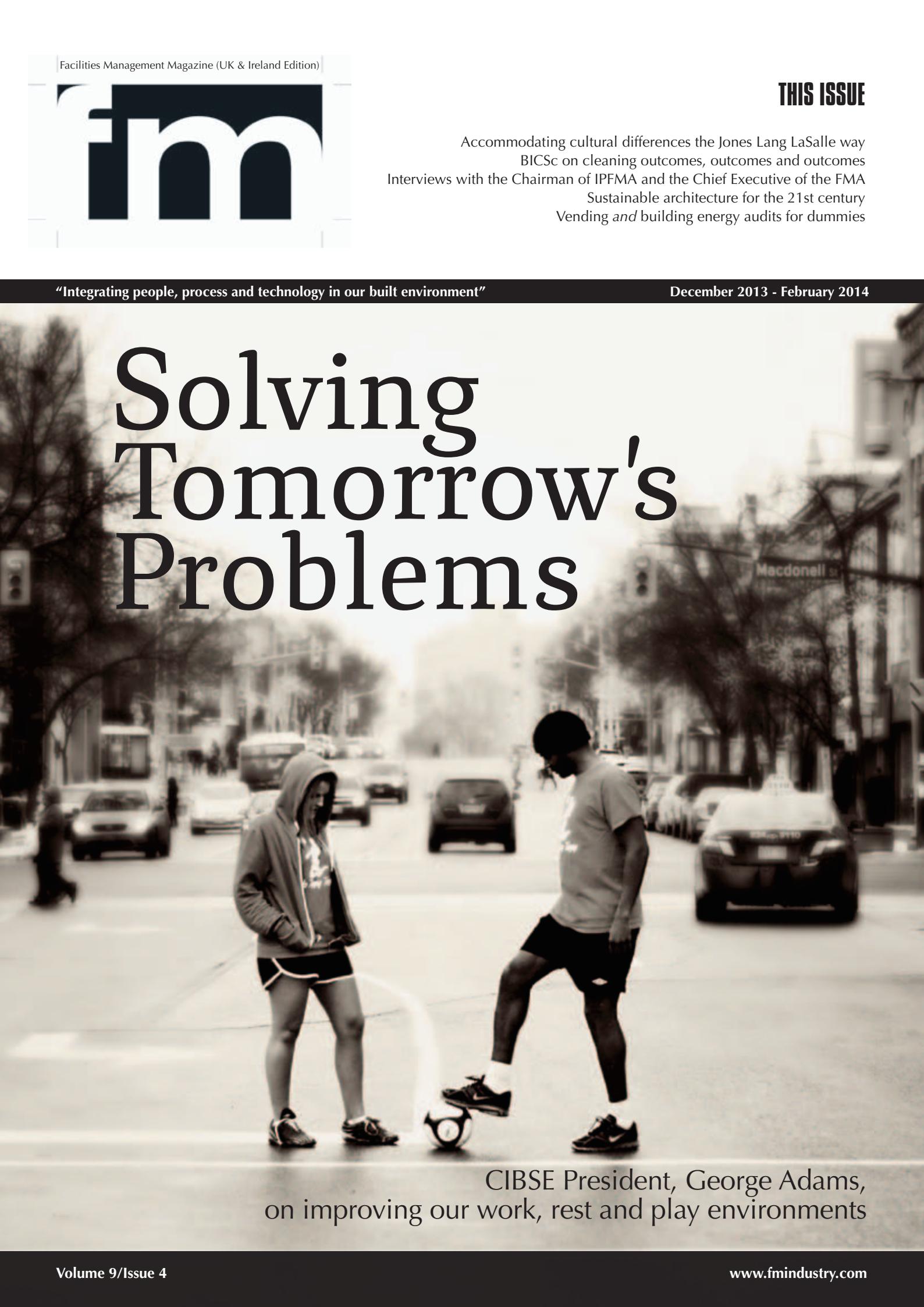
THIS ISSUE

Accommodating cultural differences the Jones Lang LaSalle way  
BICSc on cleaning outcomes, outcomes and outcomes  
Interviews with the Chairman of IPFMA and the Chief Executive of the FMA  
Sustainable architecture for the 21st century  
Vending and building energy audits for dummies

"Integrating people, process and technology in our built environment"

December 2013 - February 2014

# Solving Tomorrow's Problems



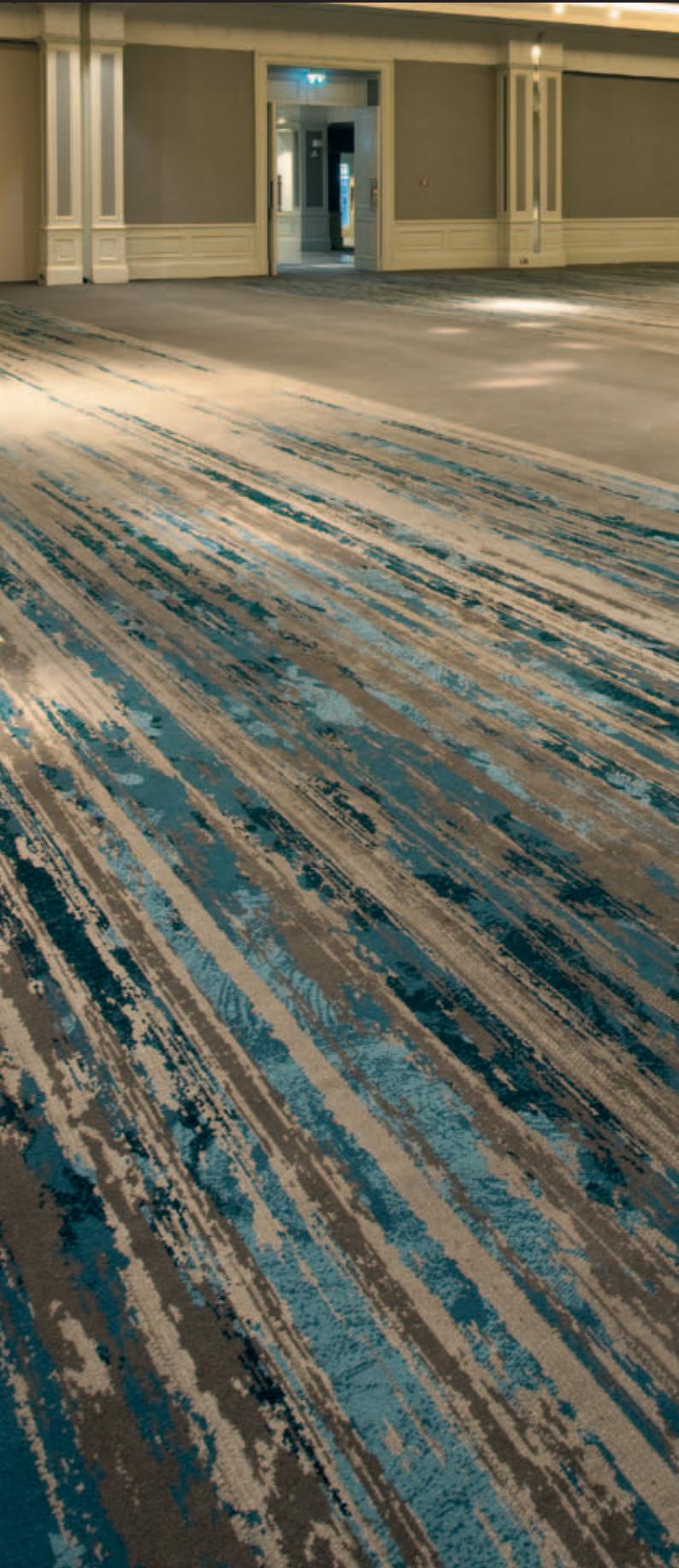
CIBSE President, George Adams,  
on improving our work, rest and play environments

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The facilities management industry is responding to market demand for one-stop solution providers by subsuming capabilities (and competencies) that were once the preserve of other industries: witness the forthcoming merger of Asset Skills, the Facilities Management Association (FMA) and the Cleaning and Support Services Association (CSSA) in the United Kingdom.

In doing so the industry risks losing its identity, however; in much the same way as scores of professionals who were formerly known (by amongst other titles) as "cleaning operatives", "security guards" and "maintenance managers", have awoken to find themselves rechristened "valued members" of soft or (as the case may be) hard service delivery teams.

For the problem with being everything is that you are simultaneously nothing unique; an explanation, perhaps, for the relative ease with which the world's largest contract catering company has been able to establish an "integrated services" subsidiary from scratch in only a few months.

Fortunately, many people can still find positives in the continuing expansion of the industry's boundaries; and not least the President of the Chartered Institute of Building Services Engineers (CIBSE) who argues in our cover article that liberating facilities management from the operational "silo" it has been assigned (or, more accurately, itself occupied) for many years, will result in greater consciousness of the relationship between FMs and building services engineers and better client outcomes (see page 18).

The Group CEO of the British Institute of Cleaning Science (BICSc) expresses similar sentiments when he reminds us that cleaning operatives are valuable members of FM teams and contribute both to outcomes and expectations (page 26).

Although, according to the Managing Director of Integrated Facilities Management (North Asia) for Jones Lang LaSalle, client outcomes are as much the product of our understanding of cultural issues, as they are systemic creations; certainly when managing the world's largest FM portfolios (page 14).

Meanwhile, the Director of the Center for Industrial Productivity and Sustainability (CIPS) argues for better waste management if FMs are to improve profit margins and returns on invested financial and human capital (see page 36).

That's before the Chief Executive of the UK's National Energy Foundation (NEF) rushes in with her blueprint for achieving *immediate* cost savings by utilising results from internally conducted building energy audits (page 22).

The Chief Executive of the Automatic Vending Association (AVA) is also concerned about energy; albeit in plug sockets operated by FMs who plan to generate additional revenue with little initial financial outlay (see page 32).

And readers who believe even the modest electricity requirement of vending machines is excessive, will find solace in an article discussing the design of "triple-Zero" rated houses by one of the world's foremost experts on sustainable architecture (page 54).

Our brave interviewees in this issue of *FM Magazine* are the Chairman of the Irish Property and Facility Management Association (IPFMA), and the Chief Executive of the Facilities Management Association (FMA).

**Said Rashid**  
Editor-in-Chief



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Vincent Hickey

## Feeling Green

**A**s the Irish Property and Facility Management Association (IPFMA) celebrates its 25th anniversary, FM Magazine discusses the future of the facilities sector in the Republic with recently inaugurated Chairman, Vincent Hickey.

In your inaugural address, you stated that the occasion of IPFMA's 25th anniversary was an opportunity to reflect on the organisation's "purpose" and "structure". Have either changed significantly over the years?

There has been momentous growth over the past 25 years in the property and facilities sector in Ireland and the IPFMA structure has responded well to this. We now find ourselves in a property and facilities market that is more professional,

regulated and demanding than ever before.

Education has played a significant part in the association's response to this market growth and we will now have to take this to another level; especially outside Dublin.

### Do property management and facilities management make good bedfellows?

Not necessarily. I think both disciplines have entirely different perspectives. Whilst both have an overall objective of maintaining the client's assets and investments, their ultimate approach to achieving this can be very different.

**T**here are those who argue that property managers will always adopt a shorter term outlook than facilities managers, since their objective is to minimise expenditure and maximise ROI for building owners. What do you believe?

I believe this to be true particularly in today's environment. The majority of leases these days are for shorter terms with favourable conditions for tenants.

Property managers are now more focused on keeping tenants' needs satisfied in order to retain them for longer periods. In recent years, building values have dropped significantly and property managers are therefore tasked with both maintaining and upgrading premises on tight budgets, and ensuring that service charges remain competitive when benchmarked against any peer premises.

### What are IPFMA estimates for the current size of the facilities management market?

Our current estimate of the facilities market in Ireland is in the region of €650 million and this is a figure that continues to grow as more and more multinationals locate in the Republic of Ireland.

### In the United Kingdom, 60 per cent of facilities management services are provided by external providers. Is the figure for Ireland comparable?

It will be lower than that in Ireland. 45 per cent is a more realistic estimate based on tender returns information.

**The European headquarters of several multinationals are located in Dublin and Cork, with “big” names including Google and key players in the life-sciences industry. Do you believe their presence has influenced the development and character of the Irish facilities management industry?**

In a major way. Their presence has driven up standards expected in the facilities market and forced many providers to improve their performance simply to ensure they are considered by these multinationals.

This is especially evident in tender documentation where testimonials, past client references and evidence of financial resilience, are all required at the request for information (ROI) stage of the tender process.

The Irish facilities market and the facilities companies which operate within these precincts have responded well to these requirements and this has improved standards significantly.

**Your corporate membership includes both multinational and local service providers. Do local companies compete effectively with their bigger cousins?**

Not really, multinationals tend to go for global facilities management suppliers and are disposed towards favouring providers they have partnered with internationally or, at the very least, companies that can provide services on a global basis if invited to do so. This is undoubtedly my experience of the Irish Market.

**Ireland is emerging as the global cloud computing hub. Are data centre operators joining IPFMA? They are, but not in the numbers**

that we would like to ensure their effective representation within the association.

This may be attributed to the traditional perception of the IPFMA as a predominantly property-focused organisation. It has been an objective of the association for a number of years to change this perception, and our FM Committee has produced several relevant and useful publications with the intention of capturing the attention of these FMs.

**The government has been promoting energy sustainability through the Sustainable Energy Authority of Ireland (SEAI). What is the relationship between IPFMA and SEAI?**

The IPFMA structure provides for active, working committees representing each function within the sector. To this end, a Sustainability Committee was established in 2012 to ensure members are kept updated on advancements in the area of sustainability. This committee has regular sessions with representatives from the SEAI to ensure we are up to date with current initiatives and that we can provide feedback on the effectiveness, or otherwise, of these initiatives.

**Does IPFMA have regulatory or disciplinary powers over member companies or is the government responsible for intra-industry regulation?**

The IPFMA is a member association and members are required to adhere to our *Code of Professional Conduct, Ethical Standards and Regulations*. Under one of the provisions of the code, the IPFMA is required to await the decision of any regulatory body investigating a

**...multinationals tend to go for global facilities management suppliers and are disposed towards favouring providers they have partnered with internationally or, at the very least, companies that can provide services on a global basis if invited to do so.**

complaint (for example, the Property Services Regulatory Authority in respect of claims of misconduct made against a member engaged in residential management), prior to launching its own investigation. Moreover, whenever formal complaints are investigated, the IPFMA reserves the right to discipline members.

**Do you require members to obtain professional certification or undertake continuing professional development (CPD)?**

We do and it is an important part of what the organisation is about.

Both the industry and levels of governance and compliance, continues to evolve.

It is vital that our members are prepared for these changes and

our CPD programmes allow us to appraise members' competence and inform them of industry best practices.

Members are required to undertake 60 hours of CPD over a three year cycle.

**There are many roads to facilities management. IPFMA itself was established under the auspices of the Society of Chartered Surveyors and represents an industry that is increasingly dominated by MEP engineers. What skillsets do facilities managers need today?**

In the early days of facilities management, the two major focuses of the facilities manager were cleaning and the air conditional environment. Indeed, it was said that if you got both areas right, you would go a long way towards having a satisfied client.

However, the industry has changed rapidly and a lot more is expected from today's FMs who need to have a working knowledge of several disciplines.

In addition to adapting to new requirements that have come about as a result of the increase in the number of higher specification type buildings, FMs are expected to be acquainted with the utilities markets, health, safety and employment legislation, fire certification, service charge guides and other finance and insurance-related areas.

These areas represent the skillsets that are required today in order to achieve success, and the IPFMA regularly adapts its educational platform to reflect this.

**As Facilities Manager at the International Financial Services Centre (IFSC) in Dublin during the 1990s you won praise for reducing service charges. How did you do it?**

IFSC was a development of high-specification buildings constructed



at a time when there was little or no regard for on-going operating costs and maintenance.

For example, no consideration was given to atrium and façade glass cleaning; and cradle systems that failed to meet basic insurance requirements were even condemned altogether by insurers!

To cite another example, an air-conditioning system was being operated around the clock simply to keep tropical plants that were part of an architectural feature alive.

And all of this translated into additional expenses.

Over the years I developed innovative systems to overcome these and many other issues and created solutions which didn't compromise the aesthetics or functionality of the property.

Incentives such as water harvesting and energy administration programmes contributed to reducing running costs.

And I was also very fortunate

in having clients who had a tremendous amount of interest in their property and its occupiers, and were always open to alternative solutions.

Awareness of a building's carbon footprint and an appreciation of the financial benefits associated with energy-efficient premises are all big motivators in reducing service charge costs.

***CPD programmes allow us to appraise members' competence and inform them of industry best practices.***



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# Trading Up

**The Facilities Management Association (FMA) describes itself as the United Kingdom's only trade association representing the facilities management sector on the grounds that its membership is limited to corporates. FM Magazine asked Chief Executive, Chris Hoar, whether his organisation's membership structure confers any significant benefits.**

**FMA member companies employ more than 500,000 people across the United Kingdom and generate a collective turnover in excess of £40 billion annually. Does your membership differ significantly from those of other associations representing the facilities management sector?**

We are often compared to other trade associations, but the FMA is the only association that looks after corporates and offers an environment for members to do business together. We actively encourage our members to know one another and discover potential business leads through networking opportunities.

**Are there any pre-qualification requirements for FMA membership?**

The only pre-qualification we require from our FMA members is that they work within the FM sector. We are open to all potential

members as long as their business and experience is relevant to the facilities management industry.

**You have developed strategic partnerships with several industry associations including The Facilities Management Forum and The Facilities Society. Why didn't you simply invite their members to join FMA instead?**

Our members benefit from being part of an association that has strategic partnerships with other organisations. Strategic partners can offer joint

benefits in addition to the opportunities that our association already provides. The FMA feels that works incredibly well for our members and our partners.

**Your stated objective is to “support member companies in their pursuit of ever-increasing standards of service and value on behalf of their clients and to assist them in improving their trading positions through innovation and thought leadership”. How successful have you been in this endeavour?**

The FMA has been very successful. We have doubled in size in the last 3 years and have many positive testimonials from our members. The profile and recognition of the organisation within our industry has continued to grow and develop, which is reflected in our membership growth.

#### **Is there anything the FMA might do better?**

One of the benefits of being part of the FMA is the fact that we provide opportunities for members to meet, network and do business together. Our networking events are currently fairly London centric and I think we could improve our offering if we were to branch out, holding events outside of London, on a more national scale.

**The drive for energy efficiency and new building management technologies will require facilities managers to develop competencies in areas historically served by mechanical, electrical and plumbing (MEP) contractors. Do you believe this will result in all facilities managers becoming MEPs or is it more likely that MEP's will simply transform themselves into integrated service providers?**

As the facilities management market evolves, there will undoubtedly still be opportunities for single service providers such as MEPs as well as total facilities management (TFM) providers. Currently though, the trend remains in favour of TFM.

**You recently entered into an exclusive partnership with the organisers of next year's Facilities Show and stated that the FMA has no plans to support other facilities management exhibitions in 2014. Why?**

The Facilities Show is certain to be a great event, developed with the aim of showcasing our amazing industry. We are extremely pleased to be supporting the Facilities Show as it is extremely important to be part of publicising the industry to other sectors and the rest of the world.

**You have held senior sales and marketing positions with construction materials company, Saint-Gobain, Vinci Construction (formerly Norwest Holst) and foodservice and support services company, Compass Group. Are facilities managers as successful at marketing and selling their services as companies operating in other built environment industries?**

**We are open to all potential members as long as their business and experience is relevant to the facilities management industry.**

Facilities managers are very successful at selling their services to clients internally, but could improve on selling externally. Key factors to consider in this process are those of FM organisations ensuring that they are approachable to prospective clients. They also need to publicise their success, as public image is crucial in securing bid tenders.



**Chris Hoar**

# He said, She said...

*A selection of quotes within this issue of FM Magazine.*

*Property managers are now more focused on keeping tenants' needs satisfied in order to retain them for longer periods. In recent years, building values have dropped significantly and property managers are therefore tasked with both maintaining and upgrading premises on tight budgets,*

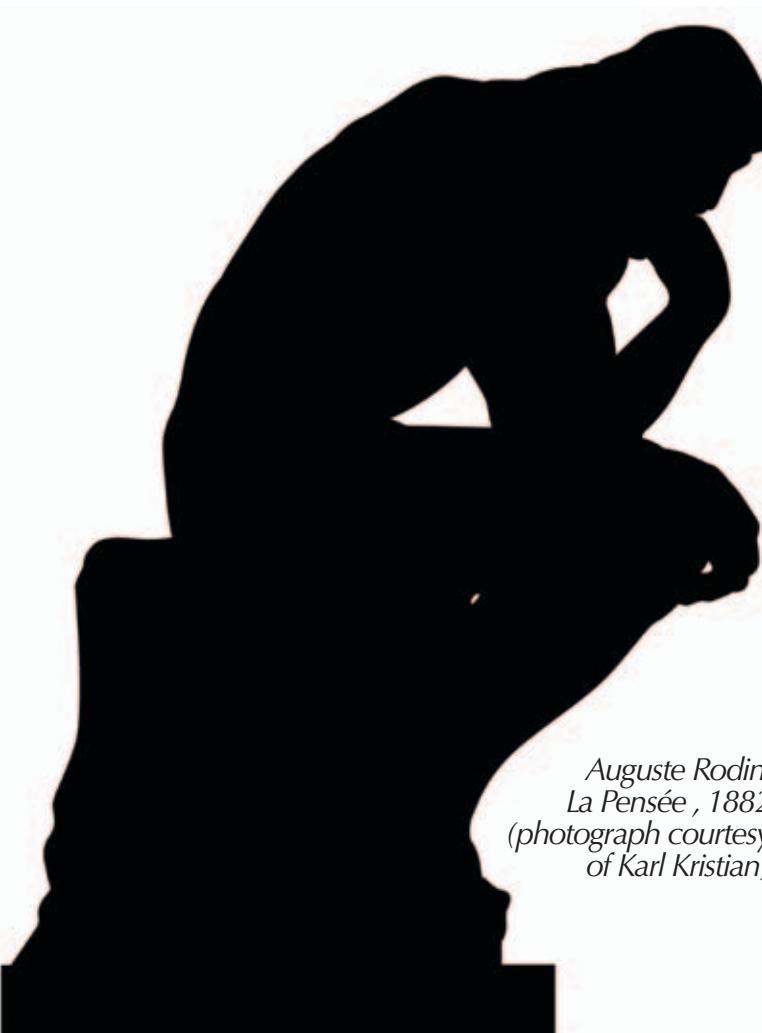
**Vincent Hickey, Chairman, Irish Property and Facility Management Association (IPFMA) on page 6.**

*As the facilities management market evolves, there will undoubtedly still be opportunities for single service providers such as MEPs as well as total facilities management (TFM) providers. Currently though, the trend remains in favour of TFM.*

**Chris Hoar, Chief Executive, Facilities Management Association (FMA) on page 11.**

*Vending operates to its optimum profit potential in well designed, high footfall sites where machines are clearly within view. It should therefore be planned as a "point of destination" that ideally brings aspects of high street coffee culture into the workplace*

**Jonathan Hilder, Chief Executive, Automatic Vending Association (AVA) on page 34.**



Auguste Rodin,  
*La Pensée*, 1882  
(photograph courtesy  
of Karl Kristian)

*Without a common language and metrics for comparison, making sense of the corporate real estate portfolio can become an uphill task. Standardisation; be it of maintenance practices, business language, real estate terminology or portfolio metrics, allows companies to deal with complications in operating their facilities...*

**Ian Bottrell, Managing Director, Integrated Facilities Management (North Asia), Jones Lang LaSalle on page 15.**

*Recent global studies (including those published under the United Kingdom's Technology Strategy Board's Building Performance Evaluation Programme) have found that, on average, non-domestic buildings use two-and-a-half times more energy than predicted.*

**Dr. Kerry Mashford, Chief Executive, National Energy Foundation on page 22.**

*Correct training of cleaning operatives and supervisors and skills refreshment are essential since agreed standards of service delivery are a pre-requirement of successful contract fulfilment.*

**Stan Atkins, Group Chief Executive Officer, British Institute of Cleaning Science (BICSc) on page 31.**

*The imperatives of sustainability will lead to fundamental change in the traditional relationships between architects and structural design engineers, and other engineering and management consultants.*

**Professor Werner Sobek, Director, Stuttgart Institute of Sustainability (SIS) on page 51.**

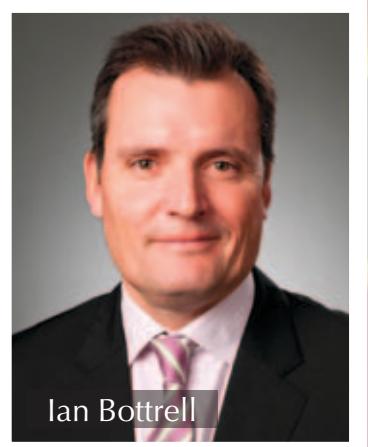
*...building owners and operators around the world are responding to legislation that has been introduced to counter the impact of population growth, rising demand for natural resources, and a growing mountain of waste.*

**Jonathan Scott, Director, Center for Industrial Productivity and Sustainability (CIPS) on page 37.**



# Tailoring FM

**Ian Bottrell, Managing Director of Integrated Facilities Management, North Asia for Jones Lang LaSalle argues challenges faced in delivering facilities management to international standards within China and the Asia-Pacific region hold valuable lessons for companies tailoring best practice to their local market needs.**



Ian Bottrell

**S**tep into Tencent's Dazu office in Shenzhen, China and you may just find yourself in awe of the creative office space designed with different visual themes for each of its eleven floors to inspire and accommodate its largely *Generation Y* staff. The traditional, gridded workspace has been transformed into a highly adaptive environment with modern facilities to encourage collaboration between employees.

Joining the ranks of the world's most enviable workplaces, China's largest internet company is taking a strategic approach toward talent retention and boosting staff productivity as it considers the changing needs of a relatively young workforce. Professional facilities management (FM) when delivered to international best practice standards can help support the creation of a more attractive working environment which, in turn, will support future talent attraction and retention.

Industry giants such as Tencent, Huawei, CICC and Lenovo belong to a new generation of young and dynamic Chinese company that is adopting FM outsourcing to gain a competitive edge against peers struggling with challenges such as accommodating headcount growth, attracting and retaining talent, boosting international credibility, and improving quality management and risk mitigation.

The benefits of successful FM implementations are many but achieving international best practice in emerging markets can present challenges. Let us consider the most common obstacles and the strategies that are being devised to overcome them in China and other major Asian economies.

*Tencent's Shenzhen office: innovative, open space that encourages mobility and collaboration*

## LIMITED SUPPLY OF FM TALENT

China may be the world's most populous nation but a significant shortage of qualified FM professionals remains a key challenge for companies considering expanding their operations in the country. At the recent World Workplace Asia (Shanghai) 2013 conference 51 per cent of polled attendees confirmed difficulty in recruiting skilled FM personnel to be the biggest barrier to implementing strategic FM operations across the mainland.

The finding echoes sentiment in Singapore where the FM industry is considered relatively mature; bolstered by strong regulatory support and growing demand from the rising number of multinational companies setting up regional operations in the country. Seventy-three per cent of senior FM professionals questioned by Jones Lang LaSalle for a survey at the World Workplace Asia (Singapore) 2012 conference cited the shortage of skilled FM personnel as the biggest hurdle to the delivery of FM services.

Operational challenges created by low availability of suitably qualified personnel are compounded by high levels of staff turnover (in China, for example, turnover levels within FM currently average between 25 and 45 per cent annually despite typical yearly salaries increasing of between 10 and 15 per cent).

Yet although these staffing challenges might appear insurmountable, there are practical measures that can be taken to proactively develop FM talent. These include:

(a) Recruiting staff with general skills (such as service orientation, technical expertise or project management) and providing them with hands on

FM training to widen the talent pool;

- (b) Creating clear, long-term career progression opportunities to retain talent and support succession planning at all levels; and
- (c) Partnering with industry organisations to develop in-house talent and ensure *front row* access for new talent coming through the ranks.

## THE CHALLENGES OF MULTI-COUNTRY SERVICE DELIVERY

Across Asia delivery of FM best practice in reception, janitorial, security and landscaping services often poses problems as a result of local nuances.

Without a common language and metrics for comparison, making sense of the corporate real estate portfolio can become an uphill task. Standardisation; be it of maintenance practices, business language, real estate terminology or portfolio metrics, allows companies to deal with complications in operating their facilities in line with international best practices.

By way of example, China is a developing economy that depends heavily on migrant workers who are often an important source of labour for soft services. Usually, these workers have attained a lower level of educational achievement than the average population (just 10 per cent of migrant workers currently in the country have experienced education beyond middle school).

When combined with language and dialectic barriers, low levels of literacy can represent a significant obstacle; although one potential solution might be to develop flexible, descriptive and pictorial training programmes.

Meanwhile in India (where 38 per cent of companies that responded

to a global survey expect real estate portfolio growth over the next three years), the country's vast cultural diversity is one of the biggest challenges to workplace transformation and the creation of productive and coherent work spaces, since a tailored approach based on a deep understanding of the country is required to accommodate the wide array of languages, religions and cultures.

## INCONSISTENT SERVICE DELIVERY

Companies expect consistency in the quality of office space and maintenance across their portfolios.

In China, the sheer size of the country and its cultural diversity across hundreds of cities may function as a roadblock to implementing consistent best practice in FM.

***Industry giants such as Tencent, Huawei, CICC and Lenovo belong to a new generation of young and dynamic Chinese company that is adopting FM outsourcing to gain a competitive edge***

Local teams may not have a grounded understanding of FM functions, and language barriers may lead to miscommunication between remote and central FM teams.

The absence of appropriate maintenance service providers in Tier II and Tier III cities in particular can cause unanticipated issues since few vendors can cover the whole country and none can guarantee a best-in-class service in every geography.

Even relatively low-skill services like cleaning suffer from a lack of quality vendors in remote locations which triggers outsourcing of services to FM partners that have the capabilities to deliver. For example, specialists from Singapore have been flown to China to run maintenance of the clean room and wider facility equipment for a major microchip manufacturing plant in a Tier II city due to the lack of qualified vendors able to deliver locally.

Companies can nevertheless take the lead by providing supplier and vendor training to mitigate the risk of poor service provision across a portfolio.

### BENCHMARK DATA & METRICS

Analysis of benchmark data on the cost and quality of maintenance, utilities and security will highlight whether facilities are being run at optimal efficiency. Many companies maintain inadequate portfolio data on rudimentary systems leading to poor information for decision-making.

As a first step companies might extract data from a portfolio to use as an initial point of reference and benchmark their operations across sites and over time.

The most successful models combine the right technology with the right processes and people for data collection and management.

Companies might also consider adopting technology solutions to automate processes and procedures; and thereby create greater efficiencies and consistency.

### MOTIVES FOR OUTSOURCING

Outsourcing FM services to specialist providers can be an effective way of gaining access to international industry best practice in emerging markets.

However, it is important to understand the motivation behind outsourcing decisions since reasons can encompass everything from the desire to achieve cost savings or minimise non-core business activity; to achieving improvements in innovation, a requirement for greater transparency, and improved energy efficiency in response to regulatory pressure to meet sustainability targets.

Whilst FM outsourcing in China remains in its infancy with companies adopting a cautious attitude and choosing to deploy in-house models utilising basic out-tasking of services such as cleaning, catering or maintenance, the practice is set to become more commonplace as the landscape becomes increasingly competitive.

Chinese companies may not always be driven by cost savings but do seek to leverage outsourcing as a vehicle for improving standards and enhancing their brand image and overall reputation.

A large yellow office chair serves as a visual metaphor, with numerous facility management terms written in white and grey text around its backrest, illustrating the interconnected nature of these services:

reception improvement portfolio efficiency growth management maintenance Property personnel optimisation

environment janitorial image people productivity security uptime talent branding facility staff

And, as they take to the international stage, improving transparency and ethics will become increasingly important since a robust FM structure based on open and transparent procurement and cost structure models minimises the risk of fraudulent behaviour.

Recent years have witnessed a surge in demand for FM services in Southeast Asian countries such as Indonesia. Whilst their motivation is mainly cost-driven, large local companies are embracing a new trend that favours outsourcing.

As a result, these companies are reaping the benefits of successful FM implementations; including improved space planning, portfolio optimisation, advanced quality management across facilities, and improved risk governance.

FM outsourcing is a relatively new concept for companies in Japan where the FM market is mature in comparison to its Asian counterparts.

Japanese business culture is shaped by the traditional values of politeness and a manufacturing mentality that stresses standardisation and high-quality service delivery; accompanied by antithesis towards outsourcing.

The FM market may therefore be one that is hard for service providers to penetrate although, for Japanese corporates looking to expand their portfolios overseas, outsourcing is

increasingly gaining acceptance as a complementary method of achieving delivery on-time and on-quality.

#### LOOKING AHEAD

Facilities managers are increasingly under pressure to drive down the total cost of occupancy whilst making portfolios highly responsive to a rapidly changing business environment.

In dynamic Asia, these challenges are magnified by the geographical scale of the region, language and cultural differences, and the presence of mature, emerging and frontier markets.

Yet broader principles can be extrapolated from the Asian experience and applied to facilities management in multicultural cities where understanding and accommodating the needs of staff who often come from different ethnic and social backgrounds will improve an organisation's ability to attract and retain the best talent.

Moreover, despite cultural differences in countries across Asia, the most successful companies are those that cultivate and manage their relationships with vendors, partners and regulatory bodies.

Consistency is essential since companies everywhere expect high-quality services to be delivered efficiently and cost-effectively.

***...broader principles can be extrapolated from the Asian experience and applied to facilities management in multicultural cities where understanding and accommodating the needs of staff who often come from different ethnic and social backgrounds will improve an organisation's ability to attract and retain the best talent.***

# Solving Tomorrow's Problems

Delivering Facilities Management  
through Building Services Engineering

**George Adams,  
President of the  
Chartered Institute  
of Building Services  
Engineers (CIBSE),  
identifies the  
opportunities for  
greater integration  
of building services  
engineers within  
facilities management  
and the wider  
community of  
built environment  
professionals.**



George Adams

**T**he built environment is hugely important for the economic and social wellbeing of any country.

Infrastructure, transport and buildings all contribute to the functionality, effectiveness and liveliness of our homes, work spaces or play areas.

Equally, their efficient operation is a central consideration in wider environmental challenges (for example, government plans in the United Kingdom to reduce carbon emissions by 80 per cent over the next 36 years).

And building technology and systems become more complex, facilities operators are turning their attention increasingly to in-use performance levels.

Improving facilities management (FM) delivery through better energy management is one area building services engineers excel at.silos.

#### **DEFINING BUILDING SERVICES ENGINEERING (BSE)**

Typically a range of responses is prompted by the question: "What is building services engineering?"

According to one school of thought, it is the design, manufacture, installation, operation and maintenance of all "energy-using" systems in a building.

Yet to others, it is a discipline that focuses on heating, ventilating and air conditioning (HVAC) systems.

Companies in the sector might describe themselves as mechanical, electrical and plumbing (MEP) contractors or as specialists in the design, installation and maintenance of electrical supply and/or lighting systems.

Regardless of their specialism, however, BSE professionals are responsible for systems that deliver functionality to buildings and make them fit for the business or social activities they are designed to support.

Building services engineering and FM both cover the life of an asset; from concept design through to its operation, maintenance, disposal and eventual replacement. This is often portrayed as a linear process but, I argue, is understood better as a cycle of continuously improving functions.

Regardless of their specialism, though, building services engineers are responsible for systems that deliver functionality to buildings and make them fit for the business or social activities they are designed to support.

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Many engineered systems in a building will be replaced more than once during its life. And this challenges the traditional compartmentalisation of the building life cycle into different stages or *silos*; under which FM is labelled an operational and maintenance activity that must accept (and make the most of) whatever is passed down to it by design and installation silos.

This is why I called for a new engineering conscience in the *Whole Life Thinking* strategy I outlined in my inaugural address as CIBSE President.

### ENGINEERING BETTER OUTCOMES

Many services systems become noticeable to occupants only because of the movement of indoor air, quality of illumination in communal spaces, variations in temperature, security issues; or because of changes to their health and physical comfort levels.

Building services engineers and FMs really must work more closely to play a fuller part in making facilities nicer places to occupy and more efficient to operate since, when problems occur, FMs and building occupants want them resolved quickly and with a minimum of disruption.



FMs with building services engineering training can assist with preventative maintenance

How this is achieved depends on the relationship and nature of the contractual engagement between the FM team and contractors they call on to attend to malfunctioning systems.

It also depends, however, on facility design, the preparedness of operators to deal with unforeseen circumstances, the quality of the FM team's training and its understanding of how systems ought to operate.

Since most buildings today incorporate inter-dependent services and systems in their design, a strong case may be made for extending building services engineering training and knowledge to all FM teams.

Notwithstanding the obvious benefits for building occupants, specialist training results in better in-house problem solving capabilities and equips

FMs with the knowledge they need to communicate effectively with specialist suppliers - or even to implement functional changes in buildings.

What unites the diverse FM models is they all need ready

access to engineering skills in order to resolve problems within a reasonable timescale.

To minimise future problems, FMs need to develop preventative maintenance programmes that make full use of in-house engineering capabilities.

FMs with engineering training might support building services engineers by contributing to original building design and, more significantly, the upgrade and replacement of existing systems since, from an operating perspective, they are best placed to understand potential pitfalls pertaining to a particular facility.

Involving FMs in decision-making and engaging them at the earliest opportunity in a facility's design also offers several, additional benefits; including reduced operating costs and less downtime.

Furthermore, by drawing on the engineering skills of the FM team early in the design process, building services engineers will ensure full adaptation of designs to expected operational demands and anticipate any future requirements.

Close cooperation between the professions will also ensure future maintenance is a consideration in architectural designs; contributing further to whole life thinking and the concept of continuous improvement.

A range of tools can assist FMs. CIBSE Guide, *Maintenance Engineering and Management*, provides extensive advice on the maintenance of building services and recommendations for the most appropriate levels of maintenance activity across a range of services; in addition to offering guidance on replacement cycles and service lives. Furthermore, it is now supported by British Standard BS 8544 (Guide for life cycle costing of maintenance) which offers detailed advice on the preparation of life cycle cost plans for buildings.

Indeed, it might also be noted BS 8544 is aligned with the Royal Institute of Chartered Surveyors' (RICS) *National Rules of Measurement* which encourage co-ordination between the work of BSI, CIBSE and RICS.

Two other areas where greater integration will increasingly be required between building services engineers in FM and wider construction and commercial teams, are energy efficiency and corporate responsibility.

There is a growing regulatory requirement for larger businesses to measure and report energy use and carbon emissions. In some cases (such as the United Kingdom's Carbon Reduction Commitment) payments must also be made depending on emission output volumes.

The second area relates to climate change since, notwithstanding debate about whether it is a direct result of carbon emissions generated by human activity, the

world is warming and our climate is experiencing more frequent occurrences of severe weather events which impacts directly on our built environment: witness recent reports about low-lying islands and coastal areas facing catastrophe in the event of global emissions targets not being met.

*Macdonell*  
CIBSE is now developing thought leadership in the built environment and working together with the Royal Institute of British Architects (RIBA) to support the technical challenges associated with reducing carbon emissions, mitigating heat island effect (built-up areas are warmer than surrounding rural areas), and creating more sustainable local urban environments.

These activities are running in parallel with an initiative by RIBA to improve collaboration between all disciplines involved in the total built environment and reflect a joint focus on sustainability that encompasses building operations and whole life performance.

Increasingly, and regardless of who or whatever is causing climate change, our buildings will have to be adapted to it. Engineers in FM teams will play their essential part in identifying and developing strategies to mitigate the potential impact of a range of climate-related events on buildings, businesses and social facilities. And they will be working alongside other built environment engineers and architects.

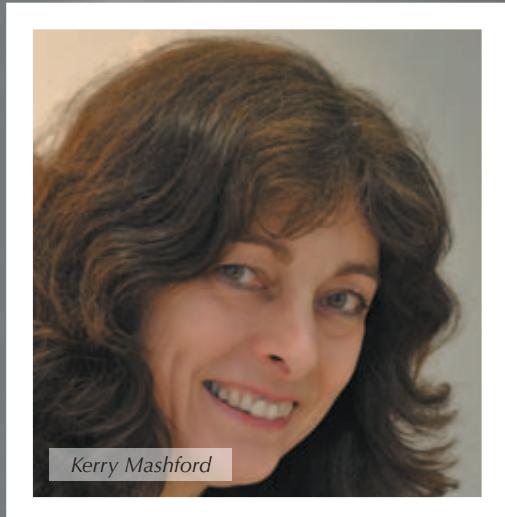
Energy efficiency and corporate environmental responsibility will align as we develop plans for our cities for the rest of the 21st century and seek to make them more resilient to the effects of climate change by reducing demand for fossil

fuels, embedding local energy generation into the built environment, and work with landscaping specialists to green local communities (green roofs, green walls and tree canopies are proven remedies against heat island effects and reduce carbon emissions).

These are strategic challenges for our society and will require a more collaborative built environment industry.

Given the importance of facilities management to business stability and the increased focus on energy management, there are huge opportunities to develop the role of the FM engineer into a specialist whose competences extend beyond delivery of daily operational support to anticipating future business needs.

***Today most buildings incorporate inter-dependent services and systems in their design. This suggests a strong case may be made for extending building services engineering training and knowledge to all FM teams.***



# WHY? WHEN? HOW?

**Dr. Kerry Mashford, Chief Executive of The United Kingdom's National Energy Foundation (NEF), which has been at the forefront of improving energy use in buildings since 1990, argues evaluating a building's energy performance is an essential component of *smart* energy management.**

Faced with the urgent and important demands that facilities managers are presented with every day, it's understandable that the equally important but less immediate challenge of optimising energy efficiency often has to take a back seat. It's often difficult, messy and complex to understand how much energy your building is using, and how to break energy down into end-uses, time periods, zones and even tenants. Then there's the question of differentiating the building's intrinsic energy use from that needed to run its operations and activities. All told, it isn't surprising that, in spite of the rhetoric surrounding the energy performance of buildings, relatively little is done in practice.

## Why and when to evaluate?

There are many reasons for evaluating the energy performance of your building. However, regardless of whether you're taking over ownership or tenancy; and even of whether a building is newly built, refurbished or established, you should never rely solely on theoretical performance assessments.

Compliance certificates - for example, Energy Performance Certificates (EPCs) and Building Regulations UK Part L (BRUKL) Certificates in the United Kingdom, are issued on the assumption that any building *as built* will mirror the *as designed* performance characteristics of its fabric and services. And although these are theoretically the same, in practice they aren't.

Recent global studies (including those published under the United Kingdom's Technology Strategy Board's *Building Performance Evaluation Programme*) have found that, on average, non-domestic buildings use *two-and-a-half times* more energy than predicted.

This performance gap arises from a combination of factors but evaluating the energy performance of your building as part of the hand-over process will enable you to ensure the fabric is up to scratch; and that services are installed and commissioned properly. The flip side of this is if you're responsible for marketing a property, potential tenants and purchasers are going to be interested increasingly in *as built* performance figures.

## ENERGY PERFORMANCE MODELLING

**The United Nations Environment Programme (UNEP) estimates buildings contribute a third of total greenhouse gas (GHG) emissions as a result of the use of fossil fuels during their operation.**

**As part of their commitment to reducing GHGs, many governments require developers to submit theoretical calculations of a new-build or retrofit project's energy consumption at the planning stage.**

**Software tools for forecasting energy flows include the Simplified Building Energy Model (SBEM) developed by the UK's BRE to meet European Union Energy Performance of Buildings Directive (EPBD) non-residential building certification requirements and the US Department of Energy (DOE) EnergyPlus simulation tool which predicts HVAC and lighting energy use.**

**Environmental assessment methods (including BREEAM, LEED, DGNB in Germany and the newer ESTIDAMA and QSAS methods in the Middle East) rely on theoretical energy modelling.**

With buildings that you already own or occupy, evaluating energy performance equips you to manage energy use better on a daily basis, and to identify and prioritise opportunities for energy-related improvements.

And although there are different motives for undertaking evaluations; including capital investment, education and building management modifications, it is certain areas for energy saving will be identified: one well-known United Kingdom property owner found it was able to save 20 per cent on landlord energy use through basic, low-tech measures, and to negotiate better energy tariffs by adjusting demand dynamically after smart, real-time

monitoring of energy use patterns in its buildings.

Comparing the energy performance of buildings in your portfolio and comparing individual buildings to others of a similar design or category, gives a real sense of how big opportunities for improvement can be and enables you to focus clearly on the low-hanging fruit of energy inefficiency.

A number of web-based tools are available (some for free) including *Carbon Buzz* and *Energy Deck*. *Carbon Buzz*, compares the "energy intensity" (annual energy use per square metre) of any given building against CIBSE TM46 sector benchmarks and data from other buildings that can be filtered to include those which are similar to yours.

Even if you don't compare energy use in your own building or buildings with others, tracking energy use over time enables future targets for reduction to be set and underpins investment decisions. For example, if service equipment becomes inefficient as it ages, monitoring energy use can alert you to equipment failures, unauthorised reprogramming of controls or changes in occupancy; and enable you to respond quickly to building occupant needs without wasting energy.

The final reason for evaluating energy performance in buildings is to protect the value of property assets and avoid any potential threat of regulatory obsolescence if performance fails to meet standards that may be required at the time of any future transfer of ownership or tenancy.



## HOW TO EVALUATE?

The old adage: "if you don't measure it, you can't manage it" applies. But what should you measure? How? How often? And how should you interpret any data?

Energy performance evaluation is a significant subset of overall building performance evaluation and, I would argue, provides valuable additional insight into why energy is used; in addition to where and when.

For in-use buildings, best practice is to carry out periodic studies (for example, during the summer and also in the winter).

Changes of circumstance; for example, in the use of a building or as a result of the replacement of key equipment, will also trigger a requirement for a new study.

All evaluations should draw on data captured over the whole year; and typically, half-hourly meter data, internal and external temperature records and services operating records.

Using a spreadsheet-based tool such as CIBSE TM22, you can capture and document the energy used by occupants and, by combining it with an occupancy profile, predict the building's expected energy uses.

If your building has a good, reconciled sub-meter arrangement, you can record measured and disaggregated energy use which will help to identify and quantify discrepancies and identify any new opportunities for energy savings.

In order to use the TM22 and similar spreadsheets, you'll need data from sensors, thermostats and meters. However, even if your building is minimally monitored, has no building management system (BMS) or only a main electricity/gas meter or simple, programmable timer for HVAC systems, space and water heating, you can still use this information in combination with an estimate (or actual count) of hours used by energy-using services and equipment (including lights and computers) to get a pretty good estimate of where, when and how energy is being used in your building.

If this is starting to sound a bit complex, think of the savings you're almost guaranteed to make.

It's also reassuring to know that specialist help is available through numerous consultancies and (in the United Kingdom) charities such as the National Energy Foundation. Many organisations will even offer advice

without up-front costs in exchange for a share of any financial savings made.

There are two other key aspects to building performance evaluation that contribute significantly to energy performance evaluation: site inspection and occupant surveys.

## SITE INSPECTION

Site inspection is about taking a good look (and listen) at your building; from top to toe, inside to outside and boardroom to plant room.

Look at the fabric of the building; look for hot spots in summer and cold spots in winter. Also look out for draughts, doors that don't quite close, cracked or broken windows, and gaps around services penetrations or where modifications have been made.

Look at services themselves, and especially HVAC systems; and check for lagging of pipes, excessive fan noise or programming that doesn't fit occupancy patterns.

Consider the settings and controls in the building. Are offices and meeting rooms too hot or cold? Do they have both heating and air-conditioning (potentially fighting each other)? Do factory floors and loading bays have large doors that stay open for longer than necessary? What about compressed air leakage? Is internal or external lighting left on overnight? How do cleaning staff leave the building? Is office equipment left on when not in use?

*Site inspection is about taking a good look (and listen) at your building; from top to toe, inside to outside and boardroom to plant room.*



Photograph courtesy of CIBSE

Ideally, carry out one site inspection during occupied hours and another when the building is not being used. Ask yourself: *how much energy is my building using when I'm not using it?*

Because the vast proportion of this energy is simply wasted, it can be a quick "win"; offering potential savings without impacting on any of the building's normal activities.

#### OCCUPANT SURVEYS

The final component of building performance evaluation (and one that is not to be underrated) is the perspective of occupants.

A structured survey method such as the Building Use Survey (BUS) which has been honed for more than 30 years following research in the United Kingdom into non-domestic post-occupancy building evaluations and includes a large database of properties already surveyed, provides maximum benefit to the surveyor as well as benchmarking against other buildings in terms of a range of comfort factors.

Alternatively, occupant feedback can be captured using a *home grown* survey at very low cost and, most importantly, individual and collective survey data

## *The final component of building performance evaluation (and one that is not to be underrated) is the perspective of occupants.*

can be cross-referenced with other information from site surveys and energy monitoring to identify wasted energy.

Consider, the example of glare on computer screens which often results in occupants of offices drawing window blinds and using additional artificial lighting during daylight hours. A simple change of the office layout can address the root cause of the problem and thereby reduce energy consumption whilst also improving the working environment.

Energy performance evaluation will increasingly be an essential responsibility of Facilities Managers and will benefit all building stakeholders; from shareholders to employees and customers.

And whilst you're likely to need external expertise when evaluating complex buildings, it is possible with only a little help, training and support to undertake basic evaluations of building energy performance.

Ultimately, all that's really required is a common sense approach, good observational skills and a willingness to act on any findings!



**Stan Atkins**

# Standing Tall

**Stan Atkins, British Institute of Cleaning Science (BICSc) Group Chief Executive Officer, discusses global cleaning standards and the importance of training cleaning operatives working in facilities management.**

The on-going protection of assets is an essential requirement of the built environment and one that extends beyond "hard" FM disciplines including maintenance of a facility's systems and external fabric, to cleaning and other "soft" services that focus on creating a pleasant indoor atmosphere for building occupants and visitors.

A facility is operated by a team which includes cleaning operatives as an integral part. And, despite cleaning activities often being labelled *low risk*, there are ever present commercial pitfalls facing cleaning providers working in facilities management.

This is because it is difficult for operatives to second-guess the degree of performance clients require; especially when many clients misunderstand the need to define realistic outcomes.

Indeed, multiple factors influence service delivery and this is the principal argument in favour of the wider adoption of published cleaning standards.

## Core Causes of Poor Service Delivery

Incorrect and difficult to clean/maintain elements and finishes within the facility

Poorly trained operatives

Wrong choice of cleaning equipment or materials

Ambiguous view of the final cleaning outcome

Insufficient staff to complete the cleaning operation

Insufficient time to complete the cleaning operation

Communication failure between the client and cleaning provider

Communication failure between the cleaning provider and the cleaning team

Adverse weather conditions

Increased footfall/occupancy

*... membership bodies and major corporates will often compete against each other to publish "standards" pertaining to identical areas of activity but succeed only in exposing fundamental differences of opinion about what really does constitutes best practice*

## Global Cleaning Standards

Standardisation has been defined as a "framework of agreements to which all relevant parties in an industry or organisation must adhere to ensure that all processes associated with the creation of a good or performance of a service are performed within set guidelines".

According to this definition, the purpose of standardisation is to ensure consistency in the quality of goods produced or services delivered and to facilitate comparison between *like* products and services.

Even within the same industry, however, membership bodies and major corporates will often compete against each other to publish "standards" pertaining to identical areas of activity but succeed only in exposing fundamental differences of opinion about what really does constitute best practice.

Fortunately the cleaning industry is different. Of the major standard providers only The International Sanitary Suppliers Association (ISSA) and The British Institute of Cleaning Science (BICSc) produce systems solely for use in the cleaning industry, making them true specialists in this field. Moreover, whilst other standards are available, few have secured widespread international acceptance.

## The Cleaning Industry Management Standard (CIMS) Programme

ISSA operates the Cleaning Industry Management Standard (CIMS) programme which is designed to manage the outcomes of existing processes whilst highlighting areas for improvement and promoting best practice across functions as diverse as service delivery, human resource management and environmental stewardship.

The IMS programme is client-driven and adaptable to a range of customer requirements. It has been designed to meet the needs of management personnel, however, and is most effective when it is used for creating specifications rather than in providing guidance to cleaning operatives about the performance of specified skills.



**Florence Nightingale**

## Healthcare & Cleaning Standardisation

The healthcare sector has been a major influence on the development of cleaning standards.

In the United Kingdom the launch of the National Health Service in 1948 (the NHS was the first state-run organisation to provide free, universal healthcare) placed scrutiny on hospital hygiene since the relationship between the cleanliness of facilities and disease was well understood (in 1858 Florence Nightingale had lobbied successfully for the establishment of a Royal Commission to investigate sanitary conditions in India).

More recently, publication of the *National Specification for Cleanliness in the NHS* (2007) resulted in the distribution of a set of detailed standards and practice guidelines to healthcare facility operators; alongside proposals for the introduction of a national "colour coding" system for prioritising cleanliness across all areas of hospital buildings (an idea BICSc had suggested as a solution for "standardising" otherwise unsynchronised systems).

Internationally, standards and best practice guidelines relating to infection prevention in care are published by several organisations including the World Health Organisation (WHO), International Federation of Infection Control (IFIC), American Society for Healthcare Environmental Services (ASHES) and The Association of Healthcare Cleaning Professionals (AHCP) in the United Kingdom.

## BICSc Standards

BICSc produces a range of cleaning operative-focused standards.

The key areas these cover are:

- PROFICIENCY
- COMPETENCY
- TECHNICAL STANDARDS

They are encompassed by the Cleaning Proficiency Skills Suite (CPSS) - on completion of mandatory units, the cleaning operative is awarded a licence to practise (LTP) which is valid for three years and admitted as a practitioner member of the institute (PBICSc).

### Cleaning outcome criteria

Standards required on completion of service delivery are set out in the BICSc *Best Value* document which is designed to remove ambiguity from output-based specifications.

### Selection of equipment, materials & cleaning methodology

BICSc operates the Accredited Cleaning System (ACS) standard which provides annual accreditation of cleaning systems to ensure that they contain four key elements:

1. Product
2. Methodology
3. Bespoke training plan
4. Consistent outcome

**Standards required on completion of service delivery are set out in the BICSc Best Value document**

### Independent Quality Cleaning Inspections (i-CQI)

Inspections are performed by BICSc personnel for the sole purpose of ensuring an independent assessment of quality standards.

A consensus-based, Acceptable Quality Level (AQL) model takes into account the opinions of the client, contractor and BICSc staff in defining the standard that will be used for assessment; with the AQL usually being set at between 90 per cent and 98 per cent.

i-CQI enables factors that are particular to any facility to be taken into account (including condition, the type of facility and even the usual cleaning frequency).

#### BICSc: Delivering Best Value

GENERAL	ACCEPTABLE ON COMPLETION OF TASKS	ACCEPTABLE BETWEEN CLEANING TASKS	UNACCEPTABLE
REMOVAL OF LOOSE DEBRIS	Free from litter, debris, dust and loose foreign matter	Debris present from previous cleaning task	Build-up of debris, debris, dust and loose foreign matter
REMOVAL OF IMPACTED DEBRIS	Free from impacted debris e.g. chewing gum, labels etc.	Debris present from previous cleaning task	Build-up of impacted debris





A BICSc accredited cleaning system:  
The Rubbermaid HYGEN™ Clean Water System

## The need for training

Correct training of cleaning operatives and supervisors and skills refreshment are essential since agreed standards of service delivery are a pre-requirement of successful contract fulfilment.

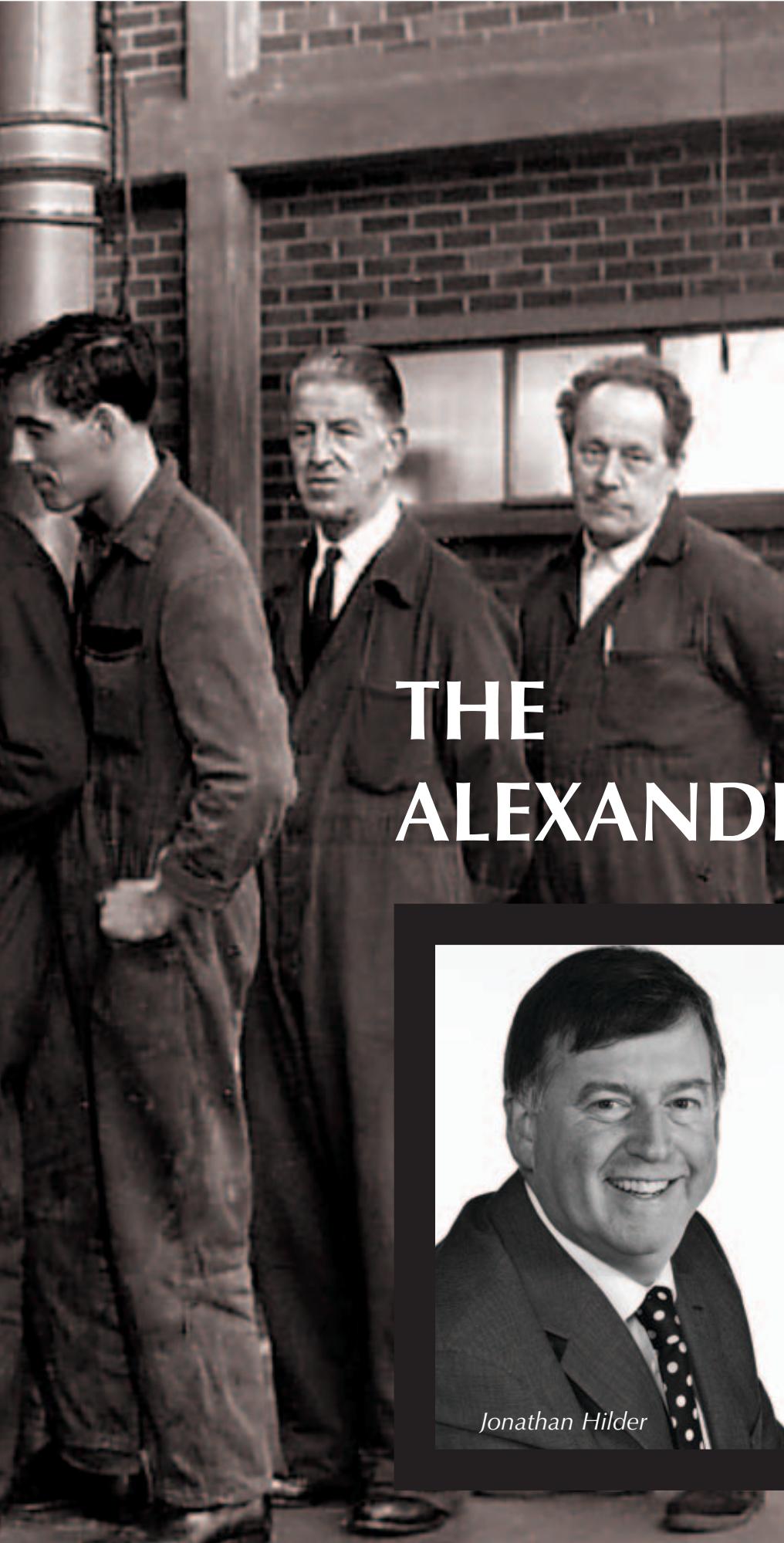
Training also reduces client dissatisfaction and eliminates the need for "rework" (and hidden costs associated with time originally spent on tasks or original materials and equipment costs) by addressing the most common reason for poor service delivery which is method failure or the application of incorrect techniques to the cleaning of elements within a facility.

Whilst BICSc has been established in the United Kingdom as a training and membership organisation for more than half a century, it is only in recent years that the institute has developed a strategy for sharing its knowledge and expertise and promoting cleaning standards globally.

Today BICSc International trains more than 6,000 cleaning operatives and institute members around the world through a network of accredited training organisations (ATOs).

*Today BICSc International trains more than 6,000 cleaning operatives and Institute members around the world.*





***Vending forms a small part of the overall service offering in this market area but it can be a significant contributor to both revenue and client satisfaction***

# THE ALEXANDRIAN JOB



Jonathan Hilder

The value of the vending market in the United Kingdom is estimated at £1.85 billion annually, with beverages accounting for a majority of sales. Automatic Vending Association (AVA) Chief Executive Officer, Jonathan Hilder, discusses the trends that are shaping the industry and explains why his association is reaching out to facilities managers.

**In May you announced jointly with the Facilities Management Association (FMA) that your organisations had become members of each other's associations in an effort to "bridge the gap" between the industries. Why did the AVA consider this necessary?**

The AVA has been aware for some time that vending in the facilities management market is not well understood and wanted to work with the FMA to develop better awareness of vending amongst FMs.

Vending forms a small part of the overall service offering in this market area but it can be a significant contributor to both revenue and client satisfaction, and it is important for FM companies to understand how they can maximise opportunities.

We had been in discussions with Chris Hoar of the FMA for some time and it was agreed that an exchange of membership would be of benefit to both associations.

**Automatic vending capabilities can be acquired by purchasing machines from manufacturers, leasing, or renting machines directly or indirectly under service agreements with specialist operators who assume responsibility for their installation, stocking and maintenance. Which option do you recommend to facilities managers?**

The placement of vending machines within facilities has always raised funding issues and questions about whether there are sufficient in-house skills to operate and engineer them.

By choosing to work with AVA members, FMs can ensure they will receive detailed plans which cater for the requirements of individual sites; in addition to pre-agreed equipment rental terms and a skilled staff base to operate machines and provide on-going technical support.

Agreed profit streams can further ensure FMs acquire the capabilities they seek without tying up significant capital into vending provision.

Bronze coins featuring the City of Alexandria [AD 134/135] (Photograph courtesy of The Trustees of the British Museum)

Factors influencing the path chosen for financing vending operations will typically include the size and complexity of the vending provision that is required since, at sites of up to 50 people, revenue will be marginal but as this number grows, installation of coffee towers or branded *bean-to-cup* machines or even fully automated catering facilities becomes much more cost effective.

The high capital cost and requirement for management and skilled labour means that an outsourced provider of vending will probably be the most cost effective route for most FMs.

**What factors do property owners and facilities managers need to account for when assessing the suitability of a particular facility or site for automatic vending operations?**

Vending operates to its optimum profit potential in well designed, high footfall sites where machines are clearly within view. It should therefore be planned as a "point of destination" that ideally brings aspects of high street coffee culture into the workplace or communal residential area by utilising vending housing and dedicated seating installations.

On a practical note, property owners and FMs will need to ensure availability of electricity and water supply; as well as easy accessibility so that operators can bring products to machines. Locating any machine on the sixth floor of a building with no lifts is never going to facilitate the transportation of replacement stock for a cold drinks vending machine!

*"Whilst I understand that profit is what drives businesses, the quality of the service offering can be equally important and this is very true in vending"*

**In the United Kingdom and Ireland beverages account for the majority of vended sales. Has using a vending machine become synonymous with “grabbing” a coffee, tea or soft drink to the degree that it is difficult for machine operators to offer other types of product?**

New innovations in alternative products vending are gaining market traction and are likely, in the long term, to alter the current balance between vending options as represented by the following numbers of machines:



Moreover, although coffee remains the major source of vending revenue, there are significant numbers of food machines.

As new food preparation technologies found in products such as the *Steamplicity* system allow fresh meals to be delivered through vending and thereby enable effective competition against staffed canteens, we expect this area to develop more strongly.

Other areas where there are developments include office products and industrial tools since both can be offered through vending and provide accountability to those using them.

Ultimately, it is only physical restrictions in terms of the dimensions and capacities of individual machines, that prevent the sale of more product types.

**Providing in-house canteen and catering facilities is a costly and labour-intensive endeavour for commercial, public sector and institutional organisations. Is it possible to deliver the same quality of food in the same quantities using machines?**

Yes it is! We have a number of AVA members who offer food products through their vending offering that I believe to be a match for any canteen.

We also have a member who has won a *Healthy Living* award from the Scottish government as a result of delivering health products and meals using vending.

The AVA's work with third-year undergraduate students from University College Birmingham (UCB) has been a huge success and resulted in the creation of some really interesting meal and snack products that are suitable for vending.

**The First Century Greek philosopher and engineer, Hero of Alexandria, is credited as the inventor of the vending machine because his book, “Mechanics and Optics”, describes a contraption that dispensed holy water using a lever and valve when a coin was introduced into a slot at the top of the machine. Has vending technology changed significantly?**

I believe Hero would be impressed by what can now be done with vending. Indeed, today, it is even used to dispense Methadone in British prisons using fingerprint and retinal identification technologies.

Screen technology is fast becoming an essential part of new vending machines that can even detect the gender and age of users. Payment options now also extend beyond simple coins to banknotes and cashless vending.

**As a judge of the inaugural *Annual Vending Industry Awards* in June you interviewed the award winners. Did you identify any common traits or characteristics that might assist facilities managers in selecting future vending partners?**

The awards were a great success and have been very well received by the industry. I was delighted to interview staff who demonstrated such passion for their companies and the jobs they do.

We were provided with some amazing testimonials from existing customers as to the lengths some staff will go to in order to help them. And I believe it is important for FMs to look beyond the contents of any proposal by physically visiting the sites potential vending partners operate and talking to the businesses they work with.

Whilst I understand that profit is what drives businesses, the quality of the service offering can be equally important and this is very true in vending. I would therefore recommend selecting a business that provides excellent support; even if this works out to be more expensive initially. Customer satisfaction will always increase future revenue potential.



Jonathan Scott

**Jonathan Scott, Director of the Center for Industrial Productivity and Sustainability (CIPS) and author of *The Sustainable Business*, explains why reducing waste opens the door to sustainable facilities management.**

**T**here are compelling financial reasons for operating facilities in a more sustainable manner.

Dutch bank, ING, reported annualised energy savings of more than €2 million within three months of relocating to new, purpose-built, "green" headquarters premises in the Zuidas district of Amsterdam.

Water recycling at PepsiCo's Frito-Lay factory In Casa Grande, Arizona currently saves the company more than US \$60 million every year.

Retail giant, Hudson's Bay, has revealed aggregated energy savings over a six year period totalling Canadian \$13 million.

And closer to home, the Co-operative Group's new headquarters building at One Angel Square in

# Waste not, Want not

Manchester, looks set to become one of the most sustainable office buildings of all time: its *energy-plus* credentials that have already won it a coveted, BREEAM "Outstanding", rating.

Behind these successes is the simple reality, however, that building owners and operators across the globe are responding to legislation that has been introduced to counter the effects of population growth and rising demand for natural resources, in particular.

## Sustainable facilities management

The word, *sustainable* is ubiquitous today. However, when it is applied within the context of facilities management, it may be defined as the "capacity to continue operating

buildings into the long-term".

In *The Fifth Discipline*, critically acclaimed author, Peter Senge, observes "rain" to be a meaningless concept if it is explained only by reference to its separate parts instead of as a whole.

And in facilities management, sustainability similarly assumes meaning only when it encompasses everything that a facilities manager does; from managing people, processes and technology, to dealing with legal, financial, social and environmental requirements.

For it is only by focusing on the *bigger picture* (rather than on short-term management priorities), that FMs can add significantly to bottom line profits.



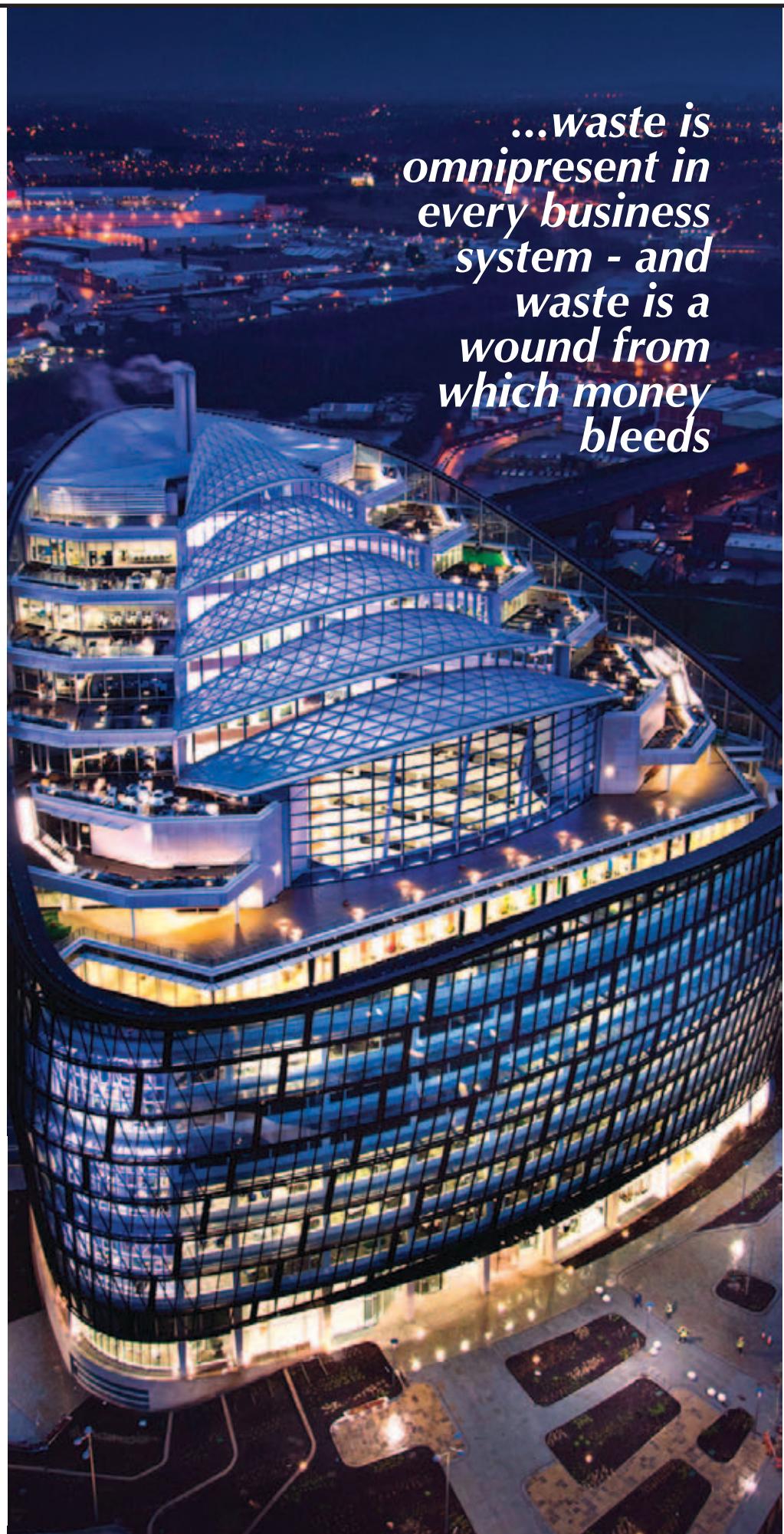
*Positive energy:* The Co-operative Group's Headquarters building at One Angel Square, Manchester, produces energy surplus to its daily requirement (photograph courtesy of The Co-operative Group).

Although, in order to understand the broader perspective, it is necessary first to identify common ground upon which the different sustainability concerns in facilities management converge: *waste elimination followed by resource-life extension* (waste is defined as not achieving 100 per cent of purchases and investments).

#### The sustainability mechanism

The *sustainability mechanism* is the term I use to refer to this common ground. And although it is not a law, it is nevertheless a rule that must be adhered to if any business seeks to profit from the numerous benefits that sustainability has to offer.

For waste is omnipresent in every business system - and waste is a wound from which money bleeds.





Just as importantly, waste isn't simply about rubbish or lighting (or machinery) left on when it is not needed; since it assumes a myriad of non-physical forms including fraud, human error, poor staff retention and bad customer relations.



#### **Joseph Ling and the 3M Corporation**

In the 1970s an employee of the 3M Corporation named Joseph Ling recognised this simple truth and introduced a ground-breaking waste elimination programme.

Leaks, spills, and other forms of wastage were reduced or eliminated; lights and machinery were turned off when not needed; scrap material was recycled back into production processes; products were reformulated using more sustainable raw materials; and equipment and manufacturing processes were redesigned to use less energy.

Today, 3M estimates that Ling's programme has saved the company more than US \$1 billion in costs over the years.

Cost-cutting alone will rarely suffice, however, since businesses must make money first. And for this reason, eliminating waste should be regarded only as the symbiotic aspect of a more focused goal: *resource-life extension*.



#### **Resource-life extension**

Conceived by industry analyst, Walter Stahel (a Ling contemporary), resource life extension - which is also known as "closed loop economics" or "the circular economy", is a profit-inducing concept based on the principle that businesses should redirect expenditure back into their business whenever possible.

Caterpillar, for example, reduces its raw material needs by remanufacturing its products as many times

ING House, Amsterdam, The Netherlands (photograph courtesy of Mig de Jong)



as possible: in some cases it can squeeze three remanufacturing cycles out of purchases of its own products from the second hand market, which effectively means that it makes a product once and sells it three times.

Think of the profit margins and the lower costs that attach to remanufacturing (instead of manufacturing from scratch); especially from the perspectives of waste elimination, increased product quality, job creation, and smaller carbon footprints.

The important lesson here is that sustainability doesn't begin and end with remanufacturing since, to use Peter Senge's rain analogy, that would be like focusing on one or two drops of water and assuming that the answer to understanding rain lies there.

Indeed, in order to benefit to the greatest degree from sustainability, it is imperative that the mechanism behind it (waste elimination leading to resource-life extension), is applied throughout every facet of a business because, without it, most business models are doomed to failure.

***...in order to benefit to the greatest degree from sustainability, it is imperative that the mechanism behind it (waste elimination leading to resource-life extension), is applied throughout every facet of a business***

Solar farm: PepsiCo's Frito-Lay factory, Arizona, United States



***... it quite possible  
to reduce the energy  
needs of buildings  
and factories by  
35% or more  
(David Klockner,  
Vice-President,  
ENERActive)***

#### **The Rule**

I was once approached by two students enrolled on a course I was teaching at the Rotterdam School of Management who wished to discuss a business plan based on the idea of wrapping inefficient industrial furnaces and boilers across Central and Eastern Europe with avant-garde technology that converts wasted heat into electricity. Their idea was to store and sell electricity so generated.

The number of poorly designed or insulated furnaces and boilers in the region is staggering, and the countries they are located in certainly need more electricity.

However, inspection of the financials revealed the value of energy wasted to be lower than of any electricity that might have been generated under the proposed scheme; which meant

the business model was destined to lose money - as can occur when any business tries to 'close its loops' before eliminating its waste.

For the sustainability mechanism must be applied to all processes and procedures, which means that even the manufacturing plant that believes it can reduce its energy costs by investing in renewables should first establish through a programme of waste elimination, whether the capital expenditure required to implement such a programme might be reduced.

Citing results from thousands of energy assessments as evidence, David Klockner, vice-president of energy consulting, engineering, and project development firm, ENERActive, says: "it is quite possible to reduce the energy needs of buildings and factories by 35% or more".



Meanwhile, researchers at the Massachusetts Institute of Technology (MIT) are currently trying to double the battery life of smartphones by reducing their energy requirement instead of focusing on increasing battery size.

To date, they have established that reducing consumption in just one area of a phone's electronics can reduce its energy requirement by 65 per cent and extend the time required between charges.

The message? Improving the way a product or service works by making it more efficient (read *waste elimination*) leads to an increase in resource-life extension possibilities (in this case, increased battery life) and greater cost savings all round.

Fortunately, the sustainability mechanism doesn't stop there. Even hard-to-quantify intangibles such

as the value that people add to a business also benefit from this rule.



An example is the development of the Starbucks Frappuccino® product line (which includes a wide range of "blended" coffees that are available in cups or bottled).

Originally the idea of a frontline employee, the suggestion was rejected by the corporate office until a store manager decided to follow the employee's instinct which resulted in a billion-dollar, star product for Starbucks.

Viewed through the prism of waste

elimination leading to resource-life extension, the story demonstrates that by recognizing and acting upon the potential of employees (read: not wasting *people*), Starbucks gets more use out of its equipment, its labour force, and its coffee shops (read: *resource-life extension*).

Underdeveloped markets provide yet more proof of the validity of the sustainability mechanism; particularly in the form of retooled business models (read: *the elimination of wasted markets*) that encourage new and repeat customers (read: *resource-life extension*).

Stated differently, an increase in customer numbers and/or repeat-customer sales is a form of waste elimination and resource-life extension for the simple reason that an untapped potential sale (or market) is a form of waste, and a

Grameenphone Headquarters, Dhaka, Bangladesh

customer not returning to a business is an example of an unclosed loop.

Understanding this is the key to how a company like Grameenphone (the Telenor joint-venture and leading mobile phone operator in Bangladesh), generates £60 million in annual profits by ethically selling mobile phone services to customers whose average yearly wage is £170.

#### Measurement is the Key

Perhaps the most useful aspect of the sustainability mechanism is its measurement component.

Corporate social responsibility (CSR), social accounting and ethical consumerism sometimes struggle with the issue of measurement, yet waste elimination and resource-life extension (think of them as two sides of the same coin) meet the need for measurement by explaining what being responsible means and providing a pathway to

quantify and record it.

In short, the sustainability mechanism is a tool that helps to make long-term business profitability easier to understand, easier to teach and easier to apply because it forces managers and employees to look at current business systems, examine the big picture, record on-going measurements, and work towards creating waste-free, streamlined operations that facilitate generation of revenues while enabling a less costly and more profitable future.

And as facilities management continues to extend the range of services that it offers; even beyond current, "non-core" offerings such as help-desk and data centre services, so shall the need for better management of waste and resource-life extension within both core and non-core services arise.

More to the point, a growing number of your competitors have already awoken to this reality!

*...the sustainability mechanism is a tool that helps to make long-term business profitability easier to understand*



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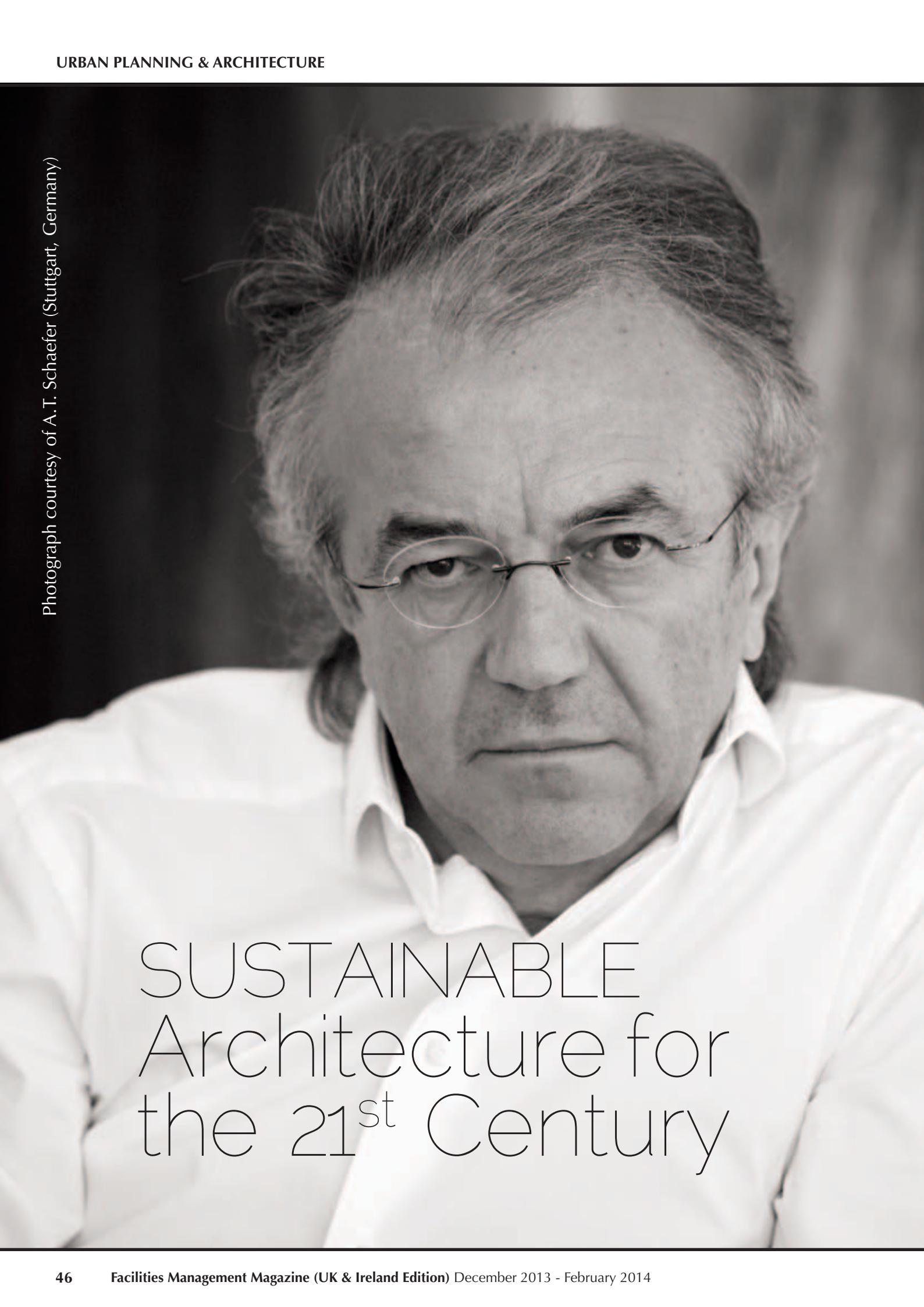
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**“Best Recycled Product 2013”**  
**(European Association of Plastics Recycling and Recovery Organisations)**

Photograph courtesy of A.T. Schaefer (Stuttgart, Germany)



A black and white close-up portrait of a middle-aged man with dark, wavy hair and glasses. He is wearing a light-colored, collared shirt. The background is dark and out of focus.

# SUSTAINABLE Architecture for the 21<sup>st</sup> Century

**M**ulti-award winning architect, Director of the Stuttgart Institute of Sustainability (SIS) and holder of the Mies van der Rohe Chair at the Illinois Institute of Technology (IIT), Professor Werner Sobek, discusses the influence of sustainability on design.

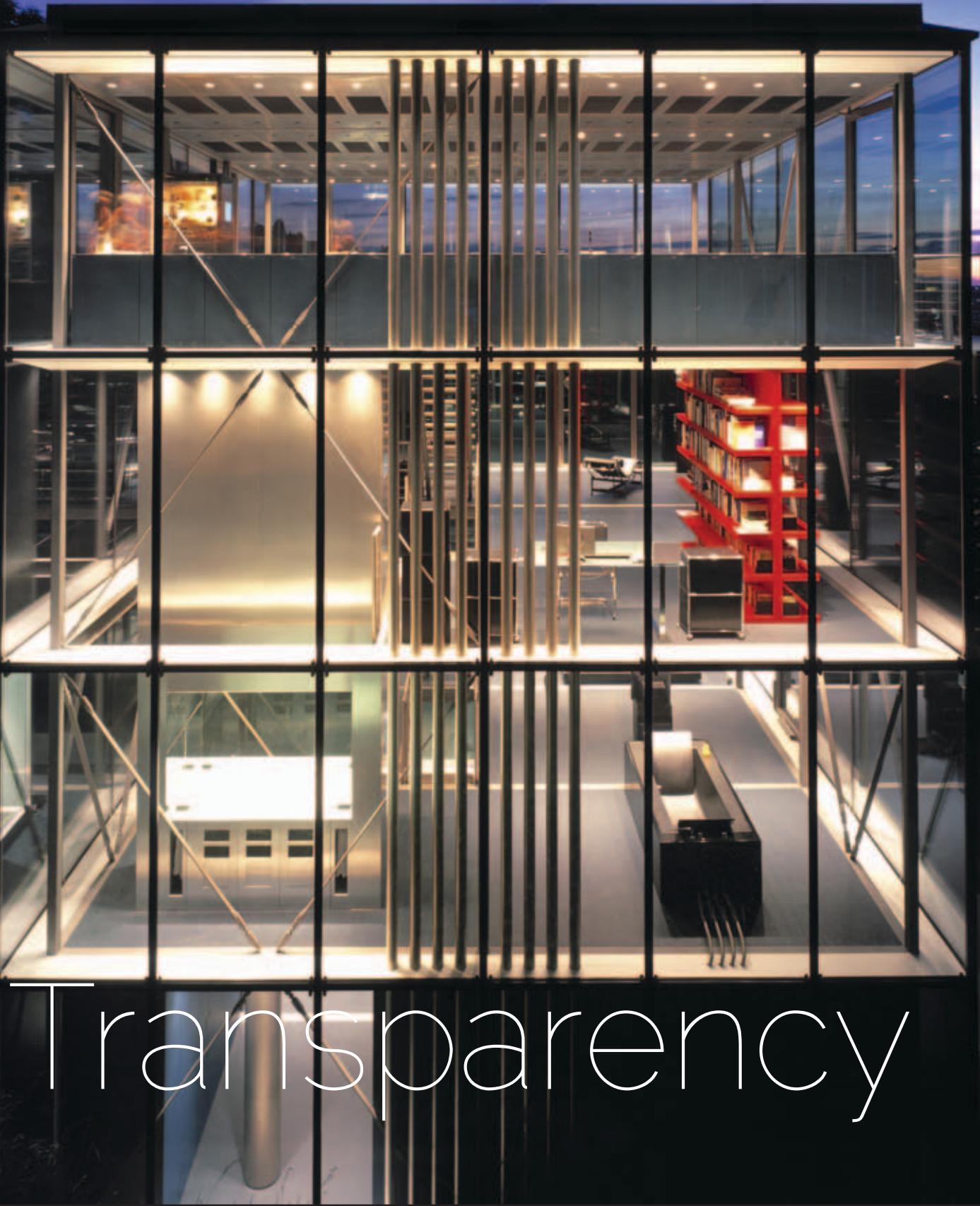
The development that has taken place in our office over the last 20 years mirrors the changes that have taken place in the general building industry. Designing, constructing and managing a building has become a much more complex process, with an increasing focus on long-term perspectives rather than short-term profits. Where our services were initially offered as highly specialised designers and structural design engineers in the field of ultra-lightweight facades, this soon extended to the *in toto* design of building structures, and within just a few years to include facade planning. It was vital to overcome the interface between the load-bearing structure and the facade, which taken together make up approximately 40 to 60 per cent of a building.

The next logical step was to extend our expertise in the fields of energy saving and recycling-friendly design, and to aim to improve the emission characteristics of buildings with the founding of the subsidiary company, WSGreenTechnologies. Interwoven with this evolution of design engineering praxis has been the related orientation to research and experimentation carried out through the medium of an academic chair and the leadership of the Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart. It is this duality of involvement that has enabled our firm to continuously refine and redefine its approach for a sustainable architecture ready for the 21st century.

The following article describes the aspects that we consider most important and that have the biggest influence on our work.

## House R128

Photograph courtesy of Roland Halbe (Stuttgart, Germany)



# Transparency



The design of housing is continually used by the practice to further develop its architectural concepts and underpin these with engineering advances. House R128 in Stuttgart (2008) is just such an experiment. It is an attempt to comprehend the architectural nature of three-dimensional transparency. The significance of R128 is to be found in the fact that transparency has here for the first time been achieved and experimented with in the third dimension, beyond the prismatic precedents of Mies van der Rohe and Philip Johnson. It is the first building in which interpenetrating sight lines are possible across four storeys.

In order to experiment with three-dimensional transparency and to experience its experiential and psychological attributes, the house was built as a personal lived-in experiment. Such a level of transparency can also be built on a large scale. Architect Christoph Ingenhoven has proven this time and again with his work: particularly significant examples of this are the European Investment Bank in Luxembourg (2007) and the Lufthansa Aviation Center in Frankfurt (2005). The Lufthansa building is located in a very difficult urban environment between the airport, railway, dual carriage way and motorway. Despite this, all of the offices are open, flooded with daylight, naturally ventilated, and offer wonderful views of the green inner courtyards. In this case the ideal of transparency is not restricted to the building envelope, but is continued throughout the inside of the building providing open, communicative structures that encourage interaction. These attributes also apply to the Post Tower in Bonn designed by Helmut Jahn (2003). The offices in this high-rise building are open to views of the surrounding area; it is possible to open windows on every level to allow fresh air into the rooms. These are examples of the experiential and environmental attributes of transparency.

A fundamental research question is: How does transparency relate to other design engineering principles that ultimately contribute to ecological design? Werner Sobek seeks to build structures that do not consume fossil fuels, do not generate any emissions and are completely recyclable. All of these things should belong to the fundamentals of designing; a point that also applies in particular to higher education at our universities, just as much as questions of structural stability, facade technologies and so on.

***A fundamental research question is: How does transparency relate to other design engineering principles that ultimately contribute to ecological design?***

# LIGHTWeightNESS

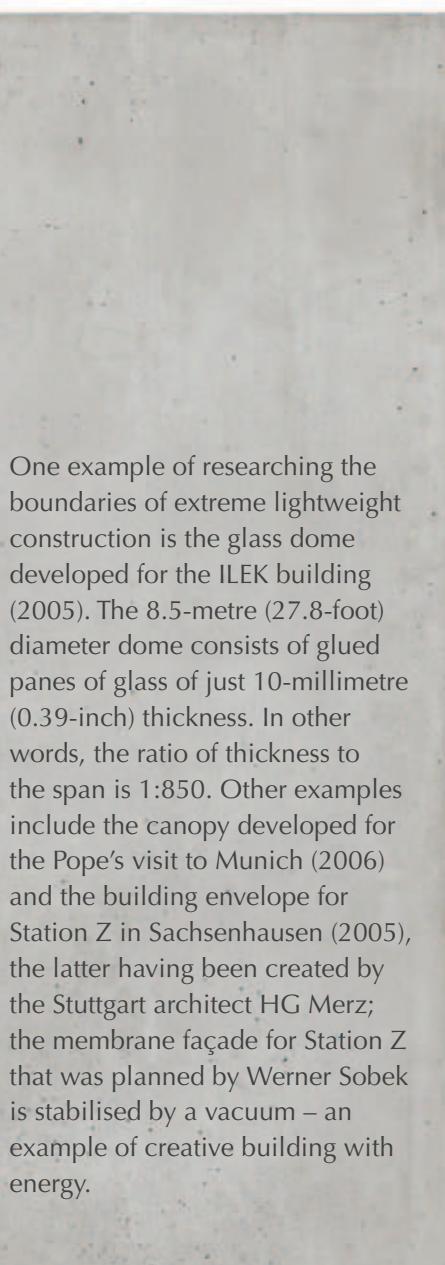
**L**ightweight constructions are a precondition for transparency. Lightweight construction means the dematerialisation of objects, to optimise weight to the limit of the possible, reducing integrated grey energy. The search for lightweight constructions is the search for boundaries.

Designing the lightest possible constructions can be equated with feeling one's way towards the limits of what is physically and technically possible. It is about the aesthetics and physics of the minimal, and it is about stepping across the dividing lines between scientific disciplines. As far as constructions that bridge long span widths, reach great heights or move are concerned, reduction of self-weight load is an economical necessity and is also often the

precondition for physical implementation. Irrespective of scale, lightweight design means savings on the mass of material deployed, and for the most part, also with regard to the amount of energy used. It is here that the ecological aspect begins: building light becomes a theoretical and ethical position.

A resolute approach to lightweight constructions requires modifications to the traditional structures of the design process. Establishing system geometries, forming and proportioning load-bearing structures as well as the selection of materials must primarily adhere to the requirement to save weight

with other requirements taking on secondary importance; for example, those resulting from architectural considerations or from manufacturing techniques. Moreover, it is not possible to create a design of structural systems of minimal weight on the basis of a simple addition of the geometrically determined building components such as supports, balconies, arches, slabs, shear walls and so on. It is much more the case that the architect or engineer creating a lightweight construction designs spatial force paths, in other words, purely statically conditioned structures, for which he or she subsequently selects suitable materials. Thus the logic of lightweight building is a 'radical, or fundamental, principle for ecological design.'



One example of researching the boundaries of extreme lightweight construction is the glass dome developed for the ILEK building (2005). The 8.5-metre (27.8-foot) diameter dome consists of glued panes of glass of just 10-millimetre (0.39-inch) thickness. In other words, the ratio of thickness to the span is 1:850. Other examples include the canopy developed for the Pope's visit to Munich (2006) and the building envelope for Station Z in Sachsenhausen (2005), the latter having been created by the Stuttgart architect HG Merz; the membrane façade for Station Z that was planned by Werner Sobek is stabilised by a vacuum – an example of creative building with energy.

## Station Z

**The white membrane facade is vacuum-stabilised, leaving no visible outer details**

**Architects: HG Merz  
Facade consultancy: Werner Sobek  
Photograph: Zooey Braun (Stuttgart, Germany)**

*Designing the lightest possible constructions can be equated with feeling one's way towards the limits of what is physically and technically possible. It is about the aesthetics and physics of the minimal.*



# GEOMETRY

In discussing new structures, the question posed is: What is 'new'? Developing force conditions has nothing to do with lining up basic, geometrically determined building blocks. The task is much more about developing structures that are nothing other than the materialisation of three-dimensional, perfectly designed systems of forces. This is the only possible way to obtain structures that have a high level of structural logic and make very efficient use of materials. Consequently, they radiate a very special form of inherent beauty.

Designing engineering is about the design of the three-dimensional flow of forces whose design space is dictated by architectural, climatic or other conditions. It is only after these force conditions have been optimised as much as possible that the designer turns to materialising the force fields with the material most suited to the task. For two-dimensional designs this is purely a finger exercise, but a huge amount of effort and creativity is required when such design is undertaken for three-dimensional structural integration.

New structures frequently involve innovative geometries. In this context, however, it is not simply a matter of optimising the building from an architectural point of view, but also from the standpoints of creating energetic structural planning and production techniques. If this is not accomplished, the resulting buildings tend rather to represent aesthetically motivated endeavours potentially limited in their habitability or usability.

Working with double-curved structures, or with biomorphic structures or bubble systems, requires a deep understanding of analytical geometry. This alone provides the basis from which it is possible to make assessments regarding the feasibility of producing the structures, as well as with regard to special issues of the building process. **The Mercedes-Benz Museum**

in Stuttgart (2006) is an example of the structural and materialisation conditions of complex geometrical structures. The double-curved, exposed concrete surfaces were created using a large number of formwork panels, each with a different border, produced utilising a water-jet cutting process to a tolerance of less than 1 millimetre (0.039 inches). The formwork panels were curved on site and provided a faceted surface.

***Designing engineering is about the design of the three-dimensional flow of forces whose design space is dictated by architectural, climatic or other conditions.***

Photograph courtesy of Roland Halbe (Stuttgart, Germany)



***The Mercedes-Benz Museum: icon of contemporary architecture  
(Architect: UN Studio, Amsterdam/Structure & Facade: Werner Sobek)***



# SUSTAINABILITY

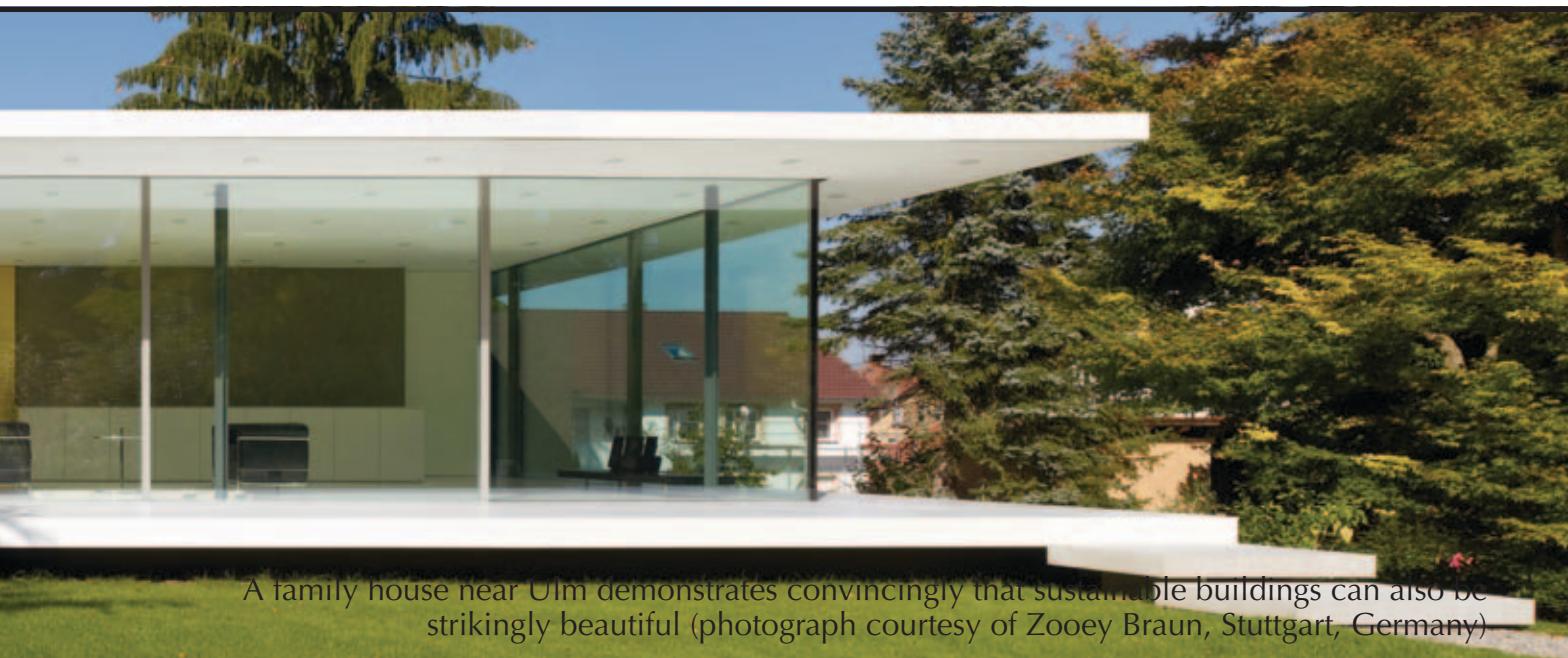
A plus-energy house with integrated electromobility  
(photograph courtesy of Ulrich Schwarz, Berlin)



***Today, very few succeed  
in building structures that  
fulfil the simple demands  
required to achieve a  
Triple Zero rating***

If aspects of sustainability and recycling are integrated with complex geometries and dematerialised structures, then the necessity for new tools and methods becomes imperative. Building must make huge changes in the face of rapidly accelerating urbanisation, the induced consumption of energy and the resulting emissions. We have simply neglected to develop the appropriate answers to these problems through research and to develop the tools and methods with which to create the solutions. Today, very few succeed in building structures that fulfil the simple demands required to achieve a Triple Zero rating (zero energy consumption, zero emissions [not just CO<sub>2</sub>] and zero waste creation).

First examples such as R128 and House D10 which is currently being planned are experimentally pushing the production of tools in the realisation of ecological values.



A family house near Ulm demonstrates convincingly that sustainable buildings can also be strikingly beautiful (photograph courtesy of Zooey Braun, Stuttgart, Germany)

It is now necessary to take a holistic view of building and design processes, considering the entire life cycle and beyond. If the components of a building are analysed, it can quickly be concluded that the load-bearing structure has a lifecycle of 50 years and more; while in facade technology a generation cycle is significantly less than 30 years, and in technical building services the generation cycles are even shorter. Consequently, buildings should be designed in a manner that allows the individual components to be removed and replaced more easily as their various service life-cycles dictate.

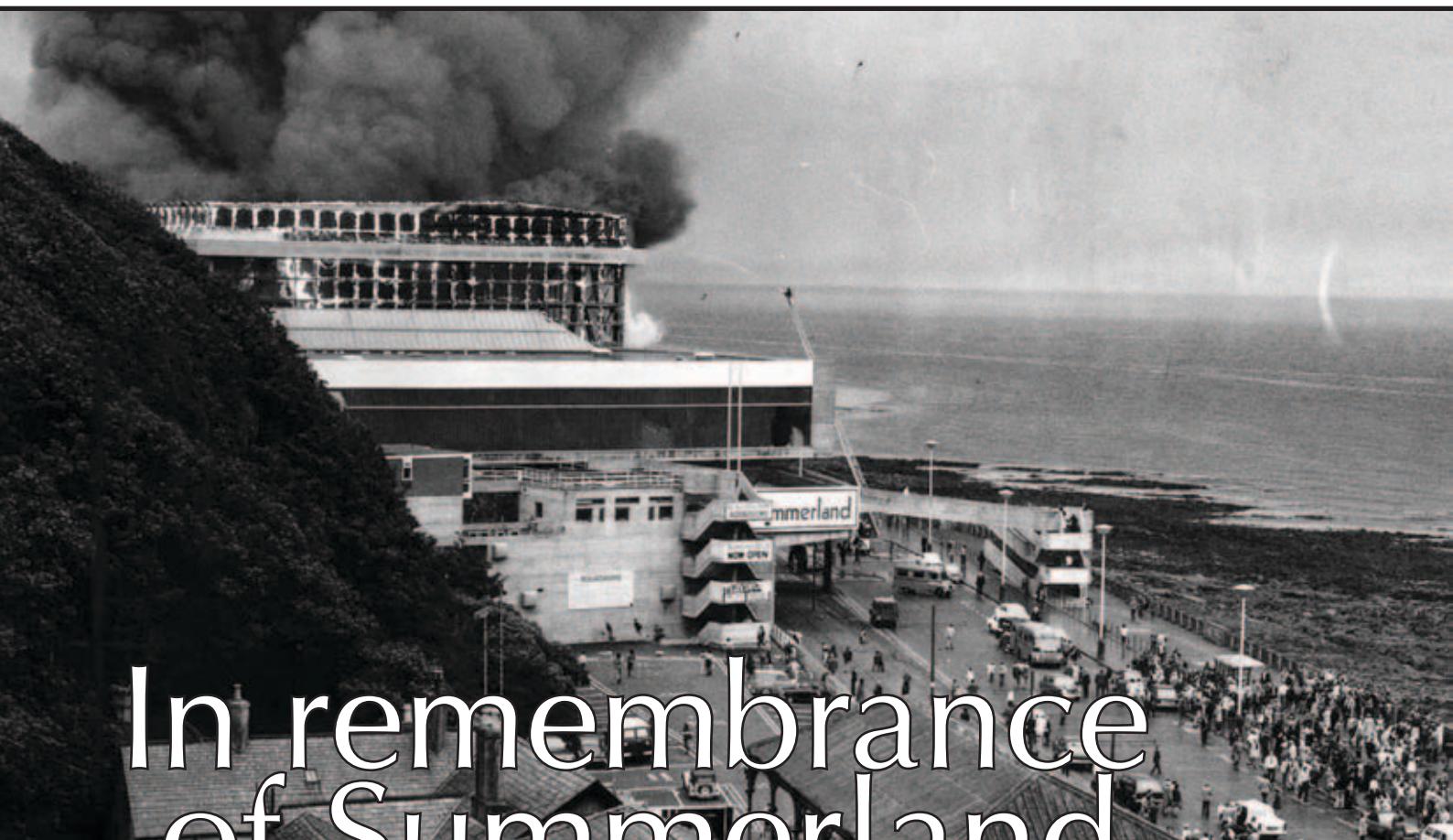
The imperatives of sustainability will lead to fundamental change in the traditional relationships between architects and structural design engineers, and other engineering and management consultants. Putting sustainability into practice requires that each

individual design engineer takes into consideration complex interrelating issues such as maintenance, repair and recycling. It requires the complete integration of aspects such as energy saving, emissions reduction and more.

This cannot be achieved with the sequential planning processes as currently practised. We need to institutionalise new approaches to integral, cross-disciplinary

This might enable those of us in new integrated teams of the design engineering professions to undertake a comprehensive examination of all relevant aspects of significance for a building and its users across its entire life cycle. It would then be possible to dedicate ourselves to the most important challenges for this century's architects and engineers: to make ecology breathtakingly attractive and exciting.

***...buildings should be designed in a manner that allows the individual components to be removed and replaced more easily as their various service life-cycles dictate.***



# In remembrance of Summerland

**In August the Mayor of Douglas unveiled a memorial to victims of one of the worst peacetime fires in the history of the British Isles. In this article, Jimmy Chiu, Business Development Director with international glass and steel glazing company, Wrightstyle, considers the legacy of the Summerland tragedy.**

An incident which started out as a minor fire at a seaside entertainment complex on the Isle of Man 40 years ago, has had far reaching implications for building regulations across the country and across the world..

The fire which broke out at the 3.5 acre Summerland resort on the Isle of Man - which advertised itself as the biggest and most innovative entertainment centre in the world (and was described as "outstanding" by the British Tourist Authority) spiralled out of control as a result of poor design and inappropriate building materials

Designed to attract visitors away from cheap overseas resorts, the centre had an indoor heated swimming pool, saunas, Turkish baths, an artificial sunshine zone, a children's theatre, an underground disco, waterfalls, and restaurants and bars with live entertainment

throughout the day.

One promotion extolled the centre as "a holiday town where it never rains, the wind never blows and the temperature never gets chilly. Outside it's raining yet here you are relaxed in your shirt sleeves, gently perspiring in a tropical 80 degrees."

Year-round artificial sunshine was achieved by a transparent roof comprising acrylic bronze-tinted sheets. There were seven floors in total and the building had a capacity for more than 5,000 people.

For just over two years the waterfront centre attracted visitors from all over the world. It appeared that the vision behind its creation was working - and taking Manx tourism into a bright future.

On the evening of Thursday 2nd August 1973 an

**"The Summerland fire claimed the lives of 50 people. The memorial will honour the memory of those who perished and its setting in the Kaye Memorial Garden will serve as a place of quiet contemplation." (Councillor David Christian, Douglas Borough Council)**

estimated 3,000 people were enjoying themselves at the resort when three schoolboys who were sharing a cigarette outside of the public gaze in a building adjacent to a dismantled fiberglass kiosk, accidentally set off a fire that was to kill 50 people and gut the entire complex.

The small fire in the kiosk triggered a number of fire events. First, the kiosk collapsed against the exterior wall of the main leisure centre building (which contained both asbestos and bitumen which has little fire-resistance).

In turn, interior sound-proofing material in the building (which also had poor fire-resistance) caught alight; causing an explosion that ignited highly flammable acrylic sheeting which was covered the building's exterior at the time.

The acrylic then melted, allowing oxygen in and contributing to more fires that blocked escape routes.

Thereafter, fire continued to spread quickly across sheeting on the building's walls and roof, and through vents that were not properly fireproofed - parts of the roof comprised of felt-covered "wood wool" slabs.

In addition, the building's open-plan design included many internal spaces that simply acted as conduits (or "chimneys") and spread fire further: with a subsequent inquiry finding absence of any

compartmentation in the space above the entrance floor; in addition to inadequately protected escape stairways.

A thirty-minute delay in alerting the fire brigade made an already bad situation worse. Indeed, even when the alarm was raised, it was by the Captain of a ship two miles out at sea, who reported: "It looks as if the whole of the Isle of Man is on fire". And it was therefore the Coastguard, rather than the resort's operator, that called the fire service.

The first fire crews to arrive on the scene quickly established the severity of the incident.

At one stage, 96 of the island's 106 firefighters were attending to the fire from all 16 of the island's fire engines.

Further compounding the tragedy, there was little or no attempt to evacuate the 3,000 people inside the centre. In a rush to escape, many were crushed and trampled because of locked exit doors. Many others then made their way to the main entrance, causing further crushing.

If that was not bad enough, emergency lighting failed after the main electrical supply was mistakenly turned off and the emergency power generator failed to start.

The main factors in the tragedy: inappropriate building materials,

lack of compartmentation, and protected escape routes; were all to come under scrutiny during the public inquiry that followed.

Whilst no individuals or groups were blamed for the fire, changes to building regulations to improve fire safety were introduced across the British Isles. These have also been the foundation of building codes and regulations in many other countries.

Central to these changes were approaches to contain fire better and protect escape routes.

This year, on the 40th anniversary of the Summerland disaster, it is worth considering another tragedy: that it has sometimes taken significant loss of life to improve building and fire regulations.

***Further compounding the tragedy, there was little or no attempt to evacuate the 3,000 people inside the centre. In a rush to escape, many were crushed and trampled***



# Strength & Shield

Horse Guard Road, London: memorial to victims of the 2002 Bali bombings  
(photograph courtesy of Eluveitie Photography)

**In the aftermath of the Boston and London bombing atrocities, Dennis Wright, Chairman of international glass and glazing systems supplier, Wrightstyle, provides his perspective on the use of construction materials in mitigating against the threat of damage from ballistic and bomb attacks.**

Over the past few months terrorism has been much in the news, from the Boston marathon bombings to the murder of a British soldier in London. In the Middle East, Shia and Sunni strife continues to exact a tragic and heavy toll.

Recent revelations about the USA's Prism metadata gathering system have only added to the impression that the terrorist threat is growing, with a renewed debate on civil and individual liberties in the digital age.

But it's also worth reminding

ourselves of the facts. According to an influential US security blogger, you are 17,600 times more likely to die from heart disease than from a terrorist attack, and 12,571 times more likely to die from cancer than from a terrorist attack.

And as an echo of 9/11, you are 11,000 times more likely to die in an airplane accident than from a terrorist plot involving an airplane.

One of the most authoritative sources on terrorism is the US National Counterterrorism Center (NCTC) which maintains statistical information on an unclassified database, the Worldwide Incidents Tracking System (WITS).

Over 10,000 terrorist attacks occurred in 2011, affecting nearly 45,000 victims in 70 countries and resulting in over 12,500 deaths. The total number of worldwide attacks in 2011, however, was almost 12 per cent lower than in 2010 and nearly

29 per cent down on 2007.

According to the US State Department, in 2012, terrorist attacks occurred in 85 countries although, as in recent years, over half of all attacks (55 per cent), fatalities (62 per cent) and injuries (65 per cent) took place only in Pakistan, Iraq and Afghanistan.

As the US State Department makes clear: "we are facing a more decentralised and geographically dispersed terrorist threat" as military operations continue to weaken terror group leaderships and organisation. The attacks in Boston and London probably support that assessment.

Countering the terrorist threat is, of course, a matter for the intelligence and military communities, backed by long-term and pragmatic political policies. You can't defeat political and religious ideology by military force alone.

However, we have to recognise that terrorism does pose an international threat, particularly from explosive devices, and in that context, a first objective of governments worldwide is to remove explosives from their arsenal.

In terms of the glass and glazing industry, it would be wrong to assume that high explosive alone is the main cause of death and injury when a bomb detonates. In urban areas, between 80-85 per cent of all secondary blast injuries are caused by flying glass.

When a bomb detonates, it produces gases at very high temperatures. This in turn leads to a rapid expansion of air and the creation of a shock wave travelling at supersonic speeds. The shock wave lasts only a few milliseconds and is then followed by an equally sudden but longer-lasting drop in pressure. It's the enormous impact of the shock wave and the subsequent suction that shatters the glass and distorts the framing.

Overall, blast injuries result in mortality ranging between 7.8 per cent in open air to 49 per cent in a confined space. A majority of victims (70 per cent) will sustain soft tissue injury, and traumatic amputations will occur in approximately 11 per cent of cases.

Most people killed or badly injured in a blast involving high-order explosives (HE) are affected by either primary or secondary blast injuries. Primary HE blast injuries are caused by high-pressure gases from the explosion rapidly expanding to produce a supersonic blast wave. This has devastating effects on human air-filled tissue, particularly the lungs and gastrointestinal tract. Primary blast injuries are generally fatal.

Secondary blast injuries caused by

flying objects, for example glass fragments, are much more common than primary blast injuries and are the most usual cause of death in blast victims. The penetrating injuries occur most often in the exposed areas of the body such as the head, neck, and extremities.

For example, in New York on 9/11, 15,500 windows were damaged within a mile of Ground Zero – nearly 9,000 within half that distance. Many injuries were glass-related.

The United States National Counterterrorism Center (NCTC) has published stand-off distance guidelines based on the typical explosive capacity of common threats; ranging from pipe bombs and suicide vests, to car and lorry bombs. However, what many architects and specifiers don't realise is that the glass and glazing industries have been fighting back, to rewrite the rules on stand-off distances and, specifically, on the danger posed by flying glass.

At Wrightstyle, we have devoted considerable resource to developing and testing our high-specification systems. Importantly, our advanced systems, designed to withstand ballistic or bomb attack, have been tested as one integrated assembly because, if the worst happens, the glass will only be as safe as its framing system – and vice versa.

Real testing is important because computer simulations can only tell you so much. Much better, if you're testing a glazing system against a bomb attack, to put a bomb beside that system, blow it up, and see what happens.

That's what we did, at an independent UK test facility inside a secure RAF base. First, we detonated a charge of 500 kg of

***When a bomb detonates, it produces gases at very high temperatures. This in turn leads to a rapid expansion of air and the creation of a shock wave travelling at supersonic speeds.***

TNT-equivalent explosive adjacent to the glazing system. That's the size of a lorry bomb.

We immediately followed that with a simulated car bomb attack (100 kg of TNT). The lorry bomb was detonated 75 metres from the test rig and the car bomb was detonated at a distance of 20 metres, producing a higher loading on the façade. Both tests were equally successful.

Reinforcing the importance of integration, the Wrightstyle system's strength was achieved through a glazing technique that bonds the glass to its framing support, so that in an explosion the components work together to safely absorb the shock and retain the glazing elements.

Also importantly, the Wrightstyle system looks exactly the same as ordinary curtain walling – making it impossible to tell if a building has been bomb-proofed.

In the glass and glazing industries, we have successfully achieved new levels of fire, ballistic and bomb safety, and are therefore making our built environment safer and more resilient.

At Wrightstyle, our systems are increasingly being specified internationally, underlining our significant investment in design and manufacturing technologies.

**2008 Marriott Hotel bombing, Islamabad, Pakistan**  
(photograph courtesy of Jawad Zakariya)



#### GLOBAL INCIDENCES OF TERRORISM

	2007	2008	2009	2010	2011
Attacks worldwide	14,415	11,663	10,968	11,641	10,283
Attacks resulting in at least 1 death, injury, or kidnapping	11,085	8,361	7,874	8,259	7,453
Attacks resulting in the death of at least 10 individuals	353	234	236	193	193
Attacks resulting in the death of at least 1 individual	7,229	5,040	4,761	4,704	4,502
Attacks resulting in the death of only 1 individual	3,982	2,870	2,695	2,691	2,550
Attacks resulting in the death of 0 individuals	7,186	6,623	6,207	6,937	5,781
Attacks resulting in the injury of at least 1 individual	6,231	4,831	4,530	4,724	4,333
Attacks resulting in the kidnapping of at least 1 individual	1,156	948	882	1,118	795
People killed, injured or kidnapped as a result of terrorism	71,803	54,290	58,720	49,928	43,990
People killed as a result of terrorism	22,720	15,709	15,311	13,193	12,533
People injured as a result of terrorism	44,103	33,901	32,660	30,684	25,903
People kidnapped as a result of terrorism	4,980	4,680	10,749	6,051	5,554

Source: United States National Counterterrorism Center (NCTC) Worldwide Incidents Tracking System



## critical infrastructure PROTECTION AND RESILIENCE EUROPE

Conference & Exhibition - 12<sup>th</sup>-13<sup>th</sup> February 2014 - London, UK

**The event not to be missed. Register Today at [www.cipre-expo.com](http://www.cipre-expo.com)**

*"Although the EC Directive has helped in 'assessing the need to improve the protection of European critical infrastructures' in the transport and energy sectors, there is no indication that it has actually improved security in these sectors."*

- **Are you aware of the future threats and risks to your critical national infrastructure?**
- **Do you know how to optimise security and implement the latest strategies and technologies?**
- **In the event of an attack, are you prepared, could you effectively react and how do you best coordinate efforts?**

The integrity of critical infrastructures and their reliable operation are vital for the well-being of the citizens and the functioning of the economy.

The ever changing nature of threats, whether natural through climate change, or man-made through terrorism activities, either physical or cyber attacks, means the need to continually review and update policies, practices and technologies to meet these demands.

The Critical Infrastructure Protection & Resilience Europe conference will deliver debate and discussion on where future threats could arise and how best to manage the changing environment to ensure maximum protection to Europe's critical infrastructure.

### Early Bird Deadline

Register by 12<sup>th</sup> January save up to 20% on delegate fees with Early Bird savings.  
Book online at [www.cipre-expo.com](http://www.cipre-expo.com).

- Learn about the latest issues, threats and risk management challenges.
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- Discover the latest in technologies and techniques for better securing your infrastructure and how to incorporate these into continuity plans.

#### Topics of discussion include:

- Emerging and Future Threats, Identification and Management
- Security and Resilience in Design
- Modelling, Simulation, Convergence and Standardisation for Improving CIP Solutions
- Cyber Threats, Detection and Security on Critical Infrastructure
- International Agency Co-operation Delivering Enhanced Command and Control
- Energy, Transport & Telecomms Infrastructure Security
- Emergency Preparedness and Response Coordination

#### Speakers include:

- Olivier Luyckx, Head of Unit, Crisis Management and Terrorism, DG Home, European Commission
- Dr Nigel Brown, Lead for Resilient ICT Strategy, Cabinet Office, Civil Contingencies Secretariat, UK
- László Szűcs, Programme Officer, Transnational Threats Department, Action against Terrorism Unit (ATU), Organization for Security and Co-operation in Europe
- Ms. Paola Albrito, Head of UNISDR Regional Office for Europe, United Nations
- Clive Bairsto, Global Head of Business Resilience and Continuity, National Grid, UK
- Dr. Evangelos Ouzounis, Head of Unit – Secure Infrastructure and Services, ENISA – European Network and Information Security Agency, Greece
- Troels Oerding, Assistant Director, Head of European Cybercrime Centre (EC3), Europol
- Andrew Wright, Head of Industrial Resources and Communications Services Group (IRCSG), NATO Operations Division
- Hans Das, Head of Unit DG ECHO, A5 Civil Protection Policy, European Commission
- Helena Lindberg, Director General, Swedish Civil Contingencies Agency (MSB), Sweden
- Phil Chesworth, Head of Infrastructure Portfolio, National Counter Terrorism Security Office (NaCTS), UK
- Annemarie Zielstra, Director International Relations, Cyber Resilience, TNO, Netherlands
- Bharat Thakrar, Head of Business Resilience Services, BT Global Security, UK
- Norman Bird, Senior Technical Lead – Nuclear Security, UK National Nuclear Laboratory (NNL), UK
- Professor Barry Clarke, President, Institution of Civil Engineers and Deputy Director, Institute for Resilient Infrastructure, UK

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# A Practical Guide to Facilities Management

**A recent book from Ian C. Barker provides an excellent overview of the FM sector and will be invaluable for students and as a practitioner's reference, writes soft services commercial manager and former recruiter, Nicola Lathbury.**

*A Practical Guide to Facilities Management* is useful reading for anyone planning to take his or her first steps into the world of FM. It is informative and gives an overview of the vast number of services that fall under the FM umbrella. It's also a great starting point for 'newbies' with little or no experience of the sector and provides a solid theoretical foundation.

The book is interspersed with tips and references which are effective in breaking-up the large volume of reading material smaller, mentally-digestible "chunks".

People with non-technical backgrounds entering the sector for the first time will also find it useful because it introduces commonly used terminology and steers readers through the sea of jargon practitioners encounter on a day-to-day basis.

With numerous organisations trying to reduce costs, many people have found themselves unexpectedly moving into the world of FM. I believe these readers will find the book invaluable;

especially when they start engaging specialists.

As someone who has never managed technical services as an FM, I believe the layout used for charts in the book will come in especially useful as a presentation template.

However, I do feel the publication is very much tailored to the education sector and the public sector more generally, and would like to have seen more private sector references included since these would have delivered a more rounded outlook. However, since the author has a strong background in the educational sector that is entirely understandable and most of the practices he describes are transferable anyway.

Moreover, if newcomers to the industry utilise the practices that are described from the outset and build on them as they acquire experience, they will (as the author writes): "find their own way, picking up tips and networking with various time-served professionals".

A great resource for anyone looking

to get into or even engage the sector, Ian Barker's book provides valuable information on the workings of the industry and the diverse nature and ever-changing role of the facilities manager.

The author, Ian C. Barker, MCIOB adds:

*"Having worked in FM for over twenty-five years, fifteen of which were in the further education sector, my innovations in FM have resulted in tangible cost savings.*

*I have amassed a wealth of Experience that could benefit up and coming FMs and am passionate about my profession and how proactive facilities management can make a difference to all organisations' bottom-line results in these testing economic times. My book is a simple, practice-based guide with numerous time-saving hints and tips to help students and practitioners avoid the most common pitfalls. It provides a readily accessible and practical guide to the increasingly important subject of facilities management".*

## A PRACTICAL INTRODUCTION TO FACILITIES MANAGEMENT

## Getting started

How to get started? Let's remind ourselves of the process needed. You will see this process of Identify, Evaluate, Plan, Action, Review throughout the book and it will assist and guide you as we go along. This process is not standardised good and bad practice. It is called the PDCA cycle. In my opinion I am not surprised to imply that all FM processes are flawed and that you should demonstrate them just for the sake of it, but, as with everything in modern life, if you stand still, then you fall. Continuous evaluation and review of your services can only be a good thing. Even when you feel you have got it right, there is always room for improvement. Standing still is not really an option in today's fast-paced society. You need to keep striving for improvement in the way you provide your services.



Try to benchmark your service as you go along. This is by far the best tool you have, as, if bench marked accurately, you will be able to plot improvements in service and convey those improvements both to your staff and to the wider organisation. If you do not feel comfortable with this methodology, adapt it to fit your work environment, or simply use the tried and tested Plan, Do, Study, Act (PDSA) methodology.

## Theory and information slot

Plan, Do, Study (check) and Act, or PDSA, was introduced by the management statistician Edwards Deming. The PDSA cycle is a continuous improvement methodology consisting of four sequential steps for problem solving, learning and improvement. It is sometimes known as Deming's Wheel, or the Continuous Improvement Spiral.

Adapted from <http://en.wikipedia.org/wiki/PDSA>

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## A PRACTICAL INTRODUCTION TO FACILITIES MANAGEMENT



particularly in educational institutions. The "learner experience" is far more valued these days and the rate almost as high as the other areas itself. This "learner experience" is an area where Facilities Managers can enhance their contribution by developing service. My background is in educational FM, so this book is sometimes biased towards education, but the same principles apply to all FM practices.

## Is there a sound reason for change?

Sometimes issues come along that demand a change to the way you are doing things, such as financial necessity, which is extremely high on the list of any government and private sector organisation. Sometimes you are faced with an issue before and will on doubt be faced with in the future. Sometimes it can be an organisation's response to these critical events that makes it stand out from the rest. Pending cuts sometimes enforce change and for the Facilities Manager this creates a challenge as to how to cut services while maintaining compliance. If a Facilities Manager truly understands his or her organisation and the services provided, then these judgements and decisions will be easier to take and will, in the long term, create a more robust organisation.

Note to self:  
When a business expands naturally the services required will change. Always bear in mind whether you have the capacity to take on these new services, or, whether you need to look for additional resources.  
  
If you are asked to reduce your budget and are expected to do this without it having any effect on the services you provide, then the first thing you are likely to do is to cut costs. If you are asked to increase your budget without changing the service, then you have been over budgeting all along. The truth is, every now and again you need to re-evaluate your budgets and the services you provide to ensure you are not suffering from "service drift".

## Service drift

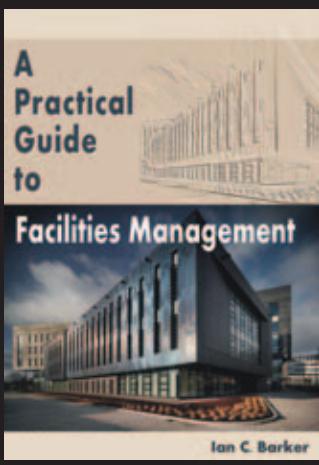
Service drift is where the service you provide develops unchecked and becomes something completely different from the original service. A simple service can organically grow through success and become something

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**"It's real value will be in a Masters course under development ..." (Birmingham School of the Built Environment, Birmingham City University)**

**"Excellent for students and practitioners" (Pilger Facility Management GmbH, FM Akademie, Austria)**

**"I believe people are finding it more readable than some other books on FM. ... "(The College of Central London)**



# Get it sussed

**Author: Ian C. Barker**  
**Publisher: Whittles Publishing**  
[www.whittlespublishing.com](http://www.whittlespublishing.com)  
**ISBN 978-184995-096-1**





## Get Connected

A selection of key international associations related in some way to facilities management. Any errors or omissions are regretted but gladly received at [editor@fmindustry.com](mailto:editor@fmindustry.com)

American Institute of Architects  
[www.aia.org](http://www.aia.org)

American Society of Heating, Refrigerating and Air-Conditioning Engineers  
[www.ashrae.org](http://www.ashrae.org)

American Society for Testing and Materials  
[www.astm.org](http://www.astm.org)

American Society of Interior Designers  
[www.asid.org](http://www.asid.org)

Association des Responsables de Services Généraux (ARSEG - French FM Association)  
[www.arseg.asso.fr](http://www.arseg.asso.fr)

Asset Skills (UK FM & cleaning skills council)  
[www.assetskills.org](http://www.assetskills.org)

Association for Environment Conscious Building  
[www.aecb.net](http://www.aecb.net)

Association for Facilities Engineers  
[www.afe.org](http://www.afe.org)

Association of Energy Engineers  
[www.aeecenter.org](http://www.aeecenter.org)

Association of Interior Specialists  
[www.ais-interiors.org.uk](http://www.ais-interiors.org.uk)

Association for Project Management  
[www.apm.org.uk](http://www.apm.org.uk)

Automatic Vending Association (UK)  
[www.ava-vending.co.uk](http://www.ava-vending.co.uk)

British Cleaning Council  
[www.britishcleaningcouncil.org](http://www.britishcleaningcouncil.org)

British Institute of Cleaning Services  
[www.bics.org.uk](http://www.bics.org.uk)

British Institute of Facilities Management  
[www.bifm.org.uk](http://www.bifm.org.uk)

Building Owners and Managers Association  
[www.boma.org](http://www.boma.org)

Chartered Institute of Building  
[www.ciob.org.uk](http://www.ciob.org.uk)

Chartered Institution of Building Services Engineers  
[www.cibse.org](http://www.cibse.org)

Chartered Institution of Wastes Management  
[www.iwm.co.uk](http://www.iwm.co.uk)

Chartered Institution of Water and Environmental Management  
[www.ciwem.org](http://www.ciwem.org)

Chartered Institute of Purchasing and Supply  
[www.cips.org](http://www.cips.org)

Cleaning and Support Services Association  
[www.cleaningindustry.org](http://www.cleaningindustry.org)

Construction Industry Council  
[www.cic.org.uk](http://www.cic.org.uk)

CoreNet Global (association of corporate real estate professionals)  
[www.corenetglobal.org](http://www.corenetglobal.org)

Custom Electronic Design & Installation Association  
[www.cedia.net](http://www.cedia.net)

DAI (Federation of German Architectural & Engineering Associations)  
[www.dai.org](http://www.dai.org)

Energy Efficient Lighting Association  
[www.iaeel.com](http://www.iaeel.com)

European Federation of Contract Catering Organisations  
[www.foodserviceeurope.org](http://www.foodserviceeurope.org)

EuroFM (European alliance of FM and built environment research institutions)  
[www.eurofm.org](http://www.eurofm.org)

Facilities Management Association (UK)  
[www.fmassociation.org.uk](http://www.fmassociation.org.uk)

Facility Management Association of Australia  
[www.fma.com.au](http://www.fma.com.au)

Facility Management Nederland  
[www.fmn-vereniging.nl](http://www.fmn-vereniging.nl)

Global FM (alliance of FM associations)  
[www.globalfm.com](http://www.globalfm.com)

Health & Safety Executive  
[www.hse.gov.uk](http://www.hse.gov.uk)

Institute of Fire Engineers  
[www.ife.org.uk](http://www.ife.org.uk)

Institute for Real Estate Management  
[www.irem.org](http://www.irem.org)

Institute of Electrical and Electronics Engineers  
[www.ieee.org](http://www.ieee.org)

Institution of Electrical Engineers  
[www.iee.org](http://www.iee.org)

Institution of Chemical Engineers  
[www.iccheme.org.uk](http://www.iccheme.org.uk)

Institution of Civil Engineering Surveyors  
[www.ices.org.uk](http://www.ices.org.uk)

Institution of Civil Engineers  
[www.ice.org.uk](http://www.ice.org.uk)

Institution of Mechanical Engineers  
[www.imeche.org.uk](http://www.imeche.org.uk)

Institution of Structural Engineers  
[www.istructe.org.uk](http://www.istructe.org.uk)

International Association for Healthcare Security and Safety  
[www.iahss.org](http://www.iahss.org)

International Association of Lighting Designers  
[www.iald.org](http://www.iald.org)

International Association of Professional Security Consultants  
[www.iapsc.org](http://www.iapsc.org)

International Cost Engineering Council  
[www.furnitremakers.org.uk](http://www.furnitremakers.org.uk)

**www.iec.ch**  
International Facility Management Association  
[www.ifma.org](http://www.ifma.org)

International Interior Design Association  
[www.iida.com](http://www.iida.com)

International Professional Security Association  
[www.ipsa.org.uk](http://www.ipsa.org.uk)

International Security Management Association  
[www.ismanet.com](http://www.ismanet.com)

Irish Property and Facility Management Association  
[www.ipfma.com](http://www.ipfma.com)

International Waste Association  
[www.iswa.org](http://www.iswa.org)

ISSA - The Worldwide Cleaning Industry Association  
[www.issa.com](http://www.issa.com)

Japan Facility Management Association  
[www.fis.jfma.or.jp](http://www.fis.jfma.or.jp)

Middle East Facility Management Association  
[www.mefma.org](http://www.mefma.org)

National Association of Corporate Real Estate Executives  
[www.nacore.com](http://www.nacore.com)

National Examination Board in Occupational Safety and Health  
[www.nebosh.org.uk](http://www.nebosh.org.uk)

National Institute of Building Sciences  
[www.nibs.org](http://www.nibs.org)

National Institute for Occupational Safety and Health  
[www.cdc.gov/niosh](http://www.cdc.gov/niosh)

National Institute of Standards and Technology  
[www.nist.gov](http://www.nist.gov)

Occupational Safety and Health Administration (United States)  
[www.osha.gov](http://www.osha.gov)

Professional Lighting and Sound Association  
[www.plasa.org](http://www.plasa.org)

Project Management Institute  
[www.pmi.org](http://www.pmi.org)

Royal Institute of British Architects  
[www.riba.org](http://www.riba.org)

Royal Institute of Chartered Surveyors  
[www.rics.org](http://www.rics.org)

South African Facilities Management Association  
[www.safma.org.sa](http://www.safma.org.sa)

The Worshipful Company of Furniture Makers  
[www.furnitremakers.org.uk](http://www.furnitremakers.org.uk)

# is for Ask

If you're fed up with being bamboozled by industry jargon, take respite in the knowledge that you're not alone. Help is at hand in the form of the acronym index below. Simply read through, memorise, baffle colleagues and expect a pay rise within a matter of days!

ADP	Automated Dumb Process
AHU	Air handling unit
AIMSS	Advanced Integrated Maintenance Support System
AO	Alternative Officing
ASP	Application Service Provider
AWS	Alternative Workplace Strategies
BA	Cnet Building Automation & Control Networks
BCP	Business Continuity Planning
BDS	Building Data Server
BIM	Building Information Modelling
BIUAS	Building In-Use Assessment System
BMS	Building Management Systems
BOOT	Build Own Operate Transfer
BOT	Build Operate Transfer
BPO	Business Process Outsourcing
BRI	Building Related Illness.
CAD	Computer-Aided Design
CAFM	Computer-Aided Facilities Management.
CAPEX	Capital Expenditure
CBM	Condition Based Maintenance
CBW	Continuous Batch Washing
CCC	Central Communications Command
CCTV	Closed Circuit Television
CFC	Chlorofluorocarbon
CFC	Common Cause Failure
CFM	Certified Facility Manager
CIFM	Computer-Integrated Facility Management
CM	Corrective Maintenance
CMIS	Cost Management Information System
CMMS	Computerized-Maintenance Management Systems
CPAF	Cost Plus Award Fee
CPARS	Contractor Performance Assessment Reporting System
CPD	Continuous Professional Development
CPE	Contractor Performance Evaluation
CPFF	Cost Plus Fixed Fee
CPIF	Cost Plus Incentive Fee
CRE	Corporate Real Estate
CRM	Customer Relationship Manager
CSR	Corporate Social Responsibility
CTD	Cumulative Trauma Disorders
DALI	Digital Addressable Lighting Interface
DBMS	Database Management Systems
DEL	Directly Employed Labour
DSO	Direct Support organization
EAC	Electronic Access Control
EAM	Enterprise Asset Management
ECG	Electronic Control Gears
EIA	Environment Impact Assessment
EIB	European Installation Bus
EMF	Electromagnetic Fields
EMP	Environmental Master Plan
EMT	Emerging Management Team
EN	European Norm
EPBD	Energy Performance in Buildings Directive
EPC	Engineering, Procurement and Construction

ERP	Enterprise Resource Planning	ITT	Invitation To Tender	RFP	Request For Proposal
ESCO	Energy Saving Company	IVR	Interactive Voice Response	RMP	Risk Management Program
FA	Facilities Annex	JIT	Just-In-Time	RMS	Remote Monitoring System
FACD	Functional Analysis, Concept, Design	JV	Joint Venture	RMS	Repetitive Motion Syndromes
FCO	Fixed Capital Outlay	KM	Knowledge Management	RPN	Risk Priority Numbers
FINS	Fault Equivalence Identification Numbers	KPI	Key Performance Indicator	RTC	Resolution Trust Corporation
FM	Facilities (or Facility) Management	LAN	Local Area Network	SBS	Sick Building Syndrome
FMEA	Failure Mode and Effect Analysis	LCC	Life Cycle Costing	SC	Shading Coefficient
FMECA	Failure Mode Effect and Criticality Analysis	LED	Light Emitting Diode	SEER	Seasonal Energy Efficiency Ratio
FMP	Facilities Management Professional	LEED	Leadership in Energy and Environmental Design	SFP	Strategic Facility Plan
FMS	Facility Management Simulation	LFD	Live Finger Detection	SHE	Safety, Health and Environment
FPI	Fixed Price Incentive	M&E	Mechanical and Electrical	SHGC	Solar Heat Gain Coefficient
FPLH	Fixed Price Labour Hour	M&R	Maintenance & Rehabilitation	SIS	Safety Instrumented Systems
FPPI	FPPI Fixed Price Plus Incentive	M2M	Machine to Machine	SLA	Service Level Agreement
FRV	Functional Replacement Value.	MDS	Maintenance Data System	SPCC	Spill Prevention, Control, and Countermeasure
FTE	Full Time Equivalent	MDS	Malfunction Detection System	SSO	Sanitary Sewer Overflow
GIS	Geographic Information System	MEP	Mechanical, Electrical, Plumbing	SMDB	Strong Motion Database
GMP	Guaranteed Maximum Price	MFD	Multifunctional Device	SMED	Single Minute Exchange of Dies
GPRS	General Positioning System	MIS	Management Information System	SPC	Statistical Process Control
GPS	Global Positioning System	MMS	Maintenance Management Software	SQL	Structured Query Language
H&S	Health & Safety	MSDS	Material Safety Data Sheet	STC	Sound Transmission Coefficient
HAZOP	Hazard Operability	MTA	Maintenance Task Analysis	STM	Serviceability Tools and Methods
HCFC	Hydrochlorofluorocarbon	MTBF	Mean Time Between Failures	SVA	Security Vulnerability Assessment
HEPA	High Efficiency Particulate Air	MTTR	Mean Time To Repair	TFM	Total Facilities Management
HGL	Hydraulic Grade Line	NPV	Net Present Value	TIFM	Total Integrated Facility Management
HID	High Intensity Discharge	NRC	Noise Reduction Coefficient	TMDL	Total Maximum Daily Load
HLD	Heavy Lifting Device	O&M	Operation and Maintenance	TPM	Total Productive Maintenance
HSS	Hollow Structural Section	OA	Office Automation	TQM	Total Quality Management
HSW	Health, Safety and Welfare	ODBMS	Object Database Management System	TSD	Treatment, Storage, and Disposal
HTFA	High Temperature Forced Air	OEE	Overall Equipment Effectiveness	TSS	Total Suspended Solids
HVAC	Heating Ventilating and Air Conditioning	OH&P	Overheads & Profit	UDL	Uniformly Distributed Load
IAP	Indoor Air Pollution	PAT	Portable Appliance Testing	UFA	Useable Floor Area
IAQ	Indoor Air Quality	PBX	Private Branch Exchange	UH	Unit Heater
IBS	Intelligent Building System	PDA	Personal Digital Assistant	USF	Useable Square Footage
ICF	Insulated Concrete Forming	PDH	Professional Development Hours	UST	Underground Storage Tank
ICS	In-floor Cleaning System	PE	Professional Engineer	VAV	Variable Air Volume
IDBB	Integrated Design/Bid/Build	PFI	Public Finance Initiative	VDT	Visual Display Terminals
IDBE	Interdisciplinary Design for the Built Environment	PHA	Process Hazard Analysis	VFD	Variable Frequency Drivers
IDQLI	Indefinite Delivery Quantity Line Item	PLC	Programmable Logical Controller	VOC	Volatile Organic Compound
IE	Invert Elevation	PLETSUS	Practices Leading Towards Sustainability	WAN	Wide Area Network
IETM	Interactive Electronic Technical Manual	PM	Property Management	W/E&SP	With Equipment and Spare Parts
IFC	Industrial Foundation Classes	PMS	Property Management System	WB	Welded Beam
IHG	Incidental Heat Gain	POE	Post-Occupancy Evaluation	WB	Wood Base
I/I	Infiltration and Inflow	POMEC	Property, Operation, Maintenance, Energy, Cost	WBF	Wood Block Floor
IO	Inspection Opening	PPE	Personal Protective Equipment	WBS	Work Breakdown Structure
IP	Internet Protocol	PPM	Planned Preventative Maintenance	WC	Water Closet
IPT	Internet Protocol Telephony	PPP	Public Private Partnership	WCAB	Wall Cabinet
ISDN	Integrated Services Digital Network	PSM	Process Safety Management	WD	Working Drawing
ISO	International Organization for Standardization	QFD	Quality Function Deployment	WEP	Water Expansion Pumping
ITS	Information Technology System	QMS	Quality Management System	WFM	Workflow Management
		QRA	Quanitified Risk Assesment	WO	Work Order
		R&D	Research & Development	WST	Water Storage Tank
		R&R	Repair and Renovation	WT	Wash Through
		RCFA	Root Cause Failure Analysis	WTP	Water Treatment Plant
		RCM	Reliability Centred Maintenance	WVT	Water Vapour Transmission
		RFID	Radio Frequency Identification	XLPE	Cross-Linked Polyethylene
				ZA	Zinc Annealed
				ZS	Zinc-Coated Steel

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